JUNE, 1961

TRAFFIC ENGINEERING

- Urban Highway Planning Legislation and Its Application in North Carolina
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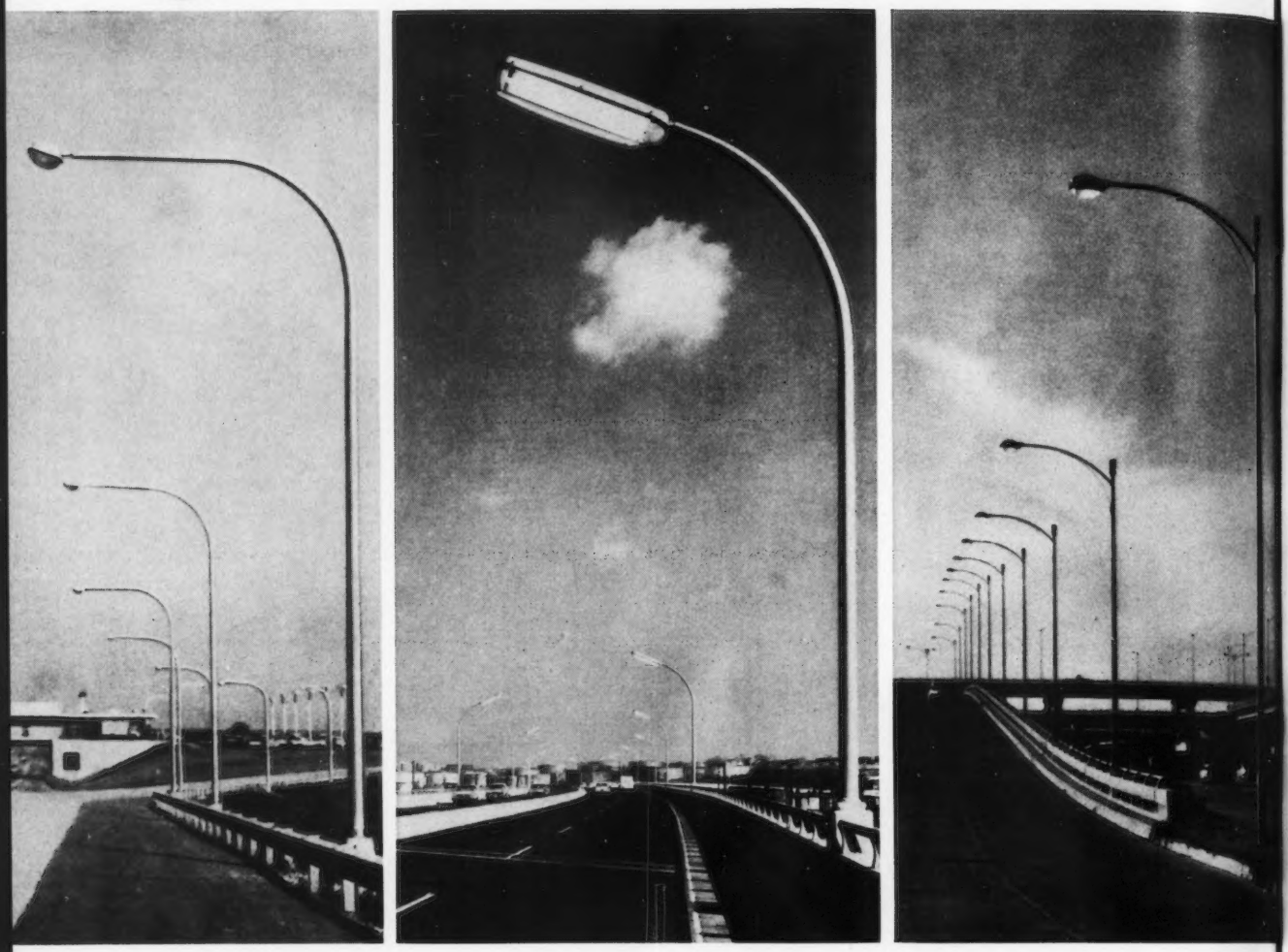

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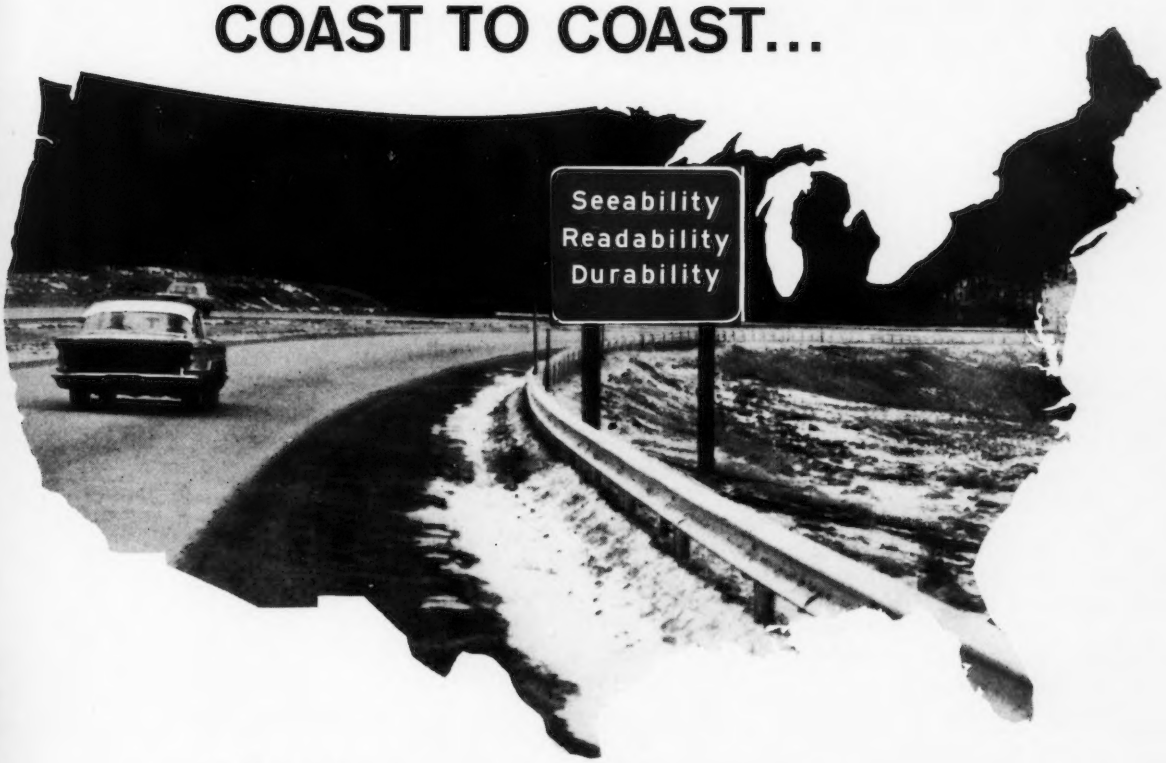

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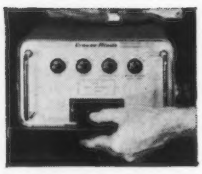

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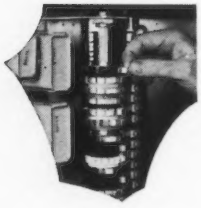

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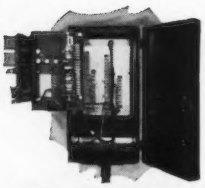

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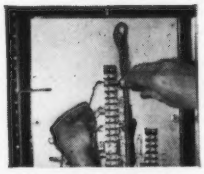

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Cover: Aerial view of the interchange between the Congress Street Expressway, the Northwest Expressway, and the new South Expressway just west of Chicago's Loop. Congress Street runs from the bottom of the photograph toward the Loop at the top of the picture, with the Northwest Expressway to the left and the new South route to the right of the interchange.

—Photo by Aerial Photograph Co., Chicago

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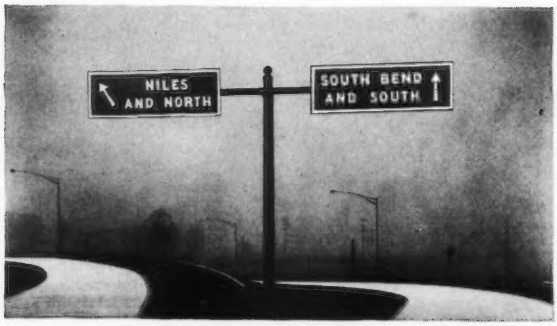

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Frankly Speaking . . .

THE TREMENDOUS GROWTH in the numbers of motor vehicles and their travel, during the past decade, have placed a heavy burden on our highway and street systems. But because we have been putting into practice the knowledge gained through research and experience in traffic control and operations, we have been able to lessen the impact of this growth and prevent a complete overloading and breakdown. Through use of improved control equipment and application of traffic engineering techniques, many streets that were overloaded or approaching that condition several years ago are now carrying much more traffic, without a proportionate increase in congestion or delay.

It is possible, however, to make still further improvements in the traffic flow on a majority of our streets, through the application of presently available knowledge. This is evidenced by the fact that at locations of extreme traffic demand, on streets of identical width and carrying traffic with similar characteristics, wide ranges are found in the peak-hour volumes handled.

Traffic engineers seldom have any responsibility for the enforcement of parking restrictions, yet they are directly concerned with the problem. This is demonstrated by data from a large number of intersection locations, well scattered throughout the country, where parking is prohibited on the approach streets. On 35 per cent of the one-way streets, and on 9 per cent of the two-way streets, there were enough parking violations to nullify completely the capacity benefits afforded by the parking restriction. In fact, the frequency of violations on the one-way streets resulted in little or no benefit, from a capacity viewpoint, for one-way operation. It is evident that the cooperation of enforcement officials is needed not only in the planning but in the operation of parking restrictions and one-way street systems.

A major responsibility of the traffic engineer is to recognize and identify the difference between an actual lack of street capacity and other impediments that cause congestion and long trip times from point to point in urban areas. Often, in heavily congested areas, there may be only a few routes that are loaded to capacity, even for short periods during peak hours. The poor service a route renders, more often than not, is the result of causes other than capacity that reduce travel to crawl speeds. If these causes are removed, travel will speed up, and the route can even carry additional traffic now avoiding it. The "Wisconsin Avenue Study" covers one such example.

Another primary responsibility of the traffic engineer is the uniformity of traffic control devices; not just in his own area, but in conformity with nationally accepted standards. In recent years, for example, almost every conceivable variation in sign size and location, traffic signal location, and pavement marking—especially for turning lanes—has been tried. Some of this non-uniformity, of course, was serious trial and experiment, to test and improve our standards for such devices during the period when the "Manual" was being revised. With the new manual available, there will still be need to develop and try new and improved techniques and practices, both through research and through trial out on the road. May we hope that all or much of this can be done on a well-planned and organized basis, so that the maximum benefit will be gained with a minimum of unnecessary duplication and a minimum of confusion to the motorist. It is he we are serving; and as far as he is concerned, the less non-uniformity, the better.

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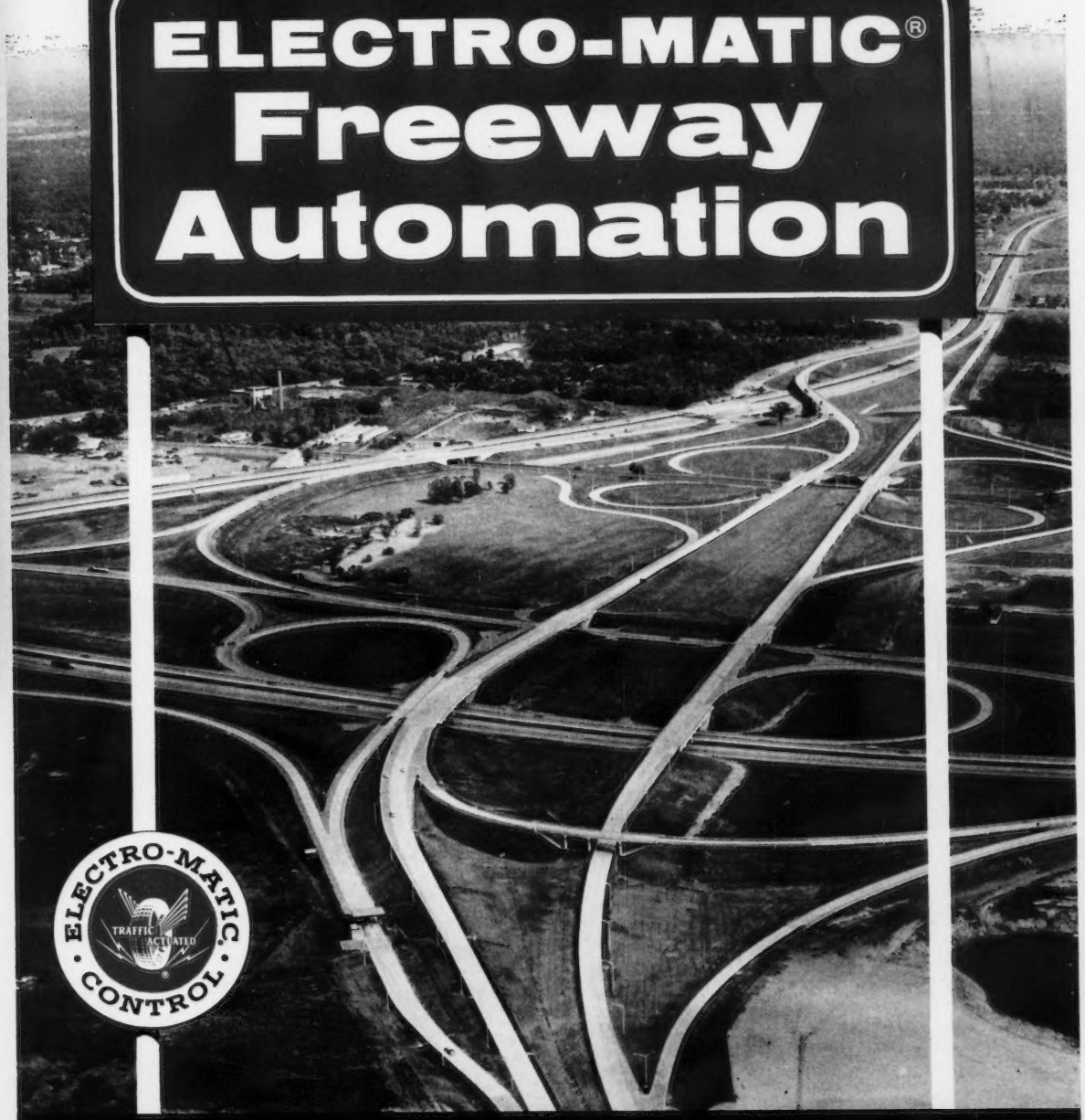

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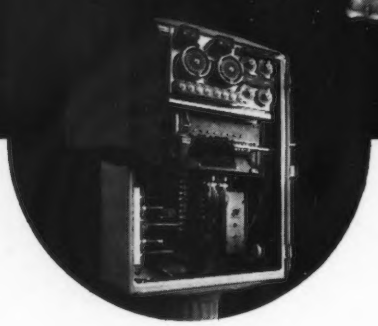

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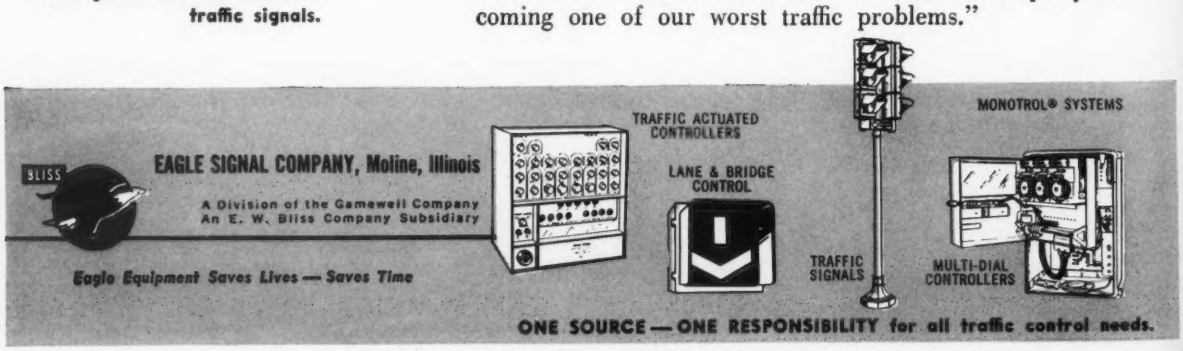
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Urban Highway Planning Legislation And Its Application in North Carolina

By Billy Rose
Urban Transportation Engineer
Advance Planning Department
North Carolina
State Highway Commission

In North Carolina, as throughout the United States, our population increase during the past three decades has occurred in and around the urban areas. This urbanization has already had and will continue to have a tremendous impact on our urban highways. The modern highway facility and the mobility provided by the automobile has permitted our new urban population to be decentralized from the industrial and commercial areas of the city. This trend, together with the trend towards increased vehicle ownership, will significantly increase the traffic volumes on our urban highways.

Industrialization is moving ahead at a rapid pace. A large portion of this new industrial growth is occurring in the fringes of built-up areas. New technological advances in industrial processes, power sources, transportation, and communications no longer rigidly restrict the location of industrial type development within the urban area.

Our urban population growth and industrial development have not been alone in experiencing the trend toward decentralization. Many of the commercial activities formerly found only in the central business district have followed the people to the fringe areas in the form of shopping centers. In many instances the development of suburban shopping centers in our smaller urban areas has been partially caused or accelerated by the inability of our municipalities to cope with the traffic problems in and around the central business district.

When the present day cities were developed, the service facilities, shops, businesses, offices and governmental units, and industrial development were in the central area. Consequently, most of our cities have a radial system of highways emanating from the central area. With the urban dispersal that is characteristic of our modern times, there is no longer a single centroid of economic activity but a tendency toward a multi-nucleated type development. Considerable volumes of traffic which have neither origin nor destination in the central area must funnel their way through the area. The lack of street systems adequate in pattern and dimensions for the proper dispersal and distribution of traffic is one of the main problems facing most cities.

Thus, today as never before, new technological, economic, and social forces are reshaping our urban areas and are creating new demands on our urban highway system. Basically our future highway problems will be the result of: (1) the trend toward urbanization and industrialization, (2) the resulting physical, cultural, and economic structure of the urban area, and (3) the adequacy of our planning for highway facilities required by these developments.

Fortunately, from the highway viewpoint, the trends towards urbanization and industrialization have in the past occurred more slowly in our state than in the northern and central parts of the country. Recognizing that we can profit by the experiences of others in planning too late with too little and recognizing that with sound planning North Carolina can be "an accessory before the fact of this condition" rather than "an aocessory after the fact of traffic congestion and stagnation," our State Legislature and State Highway Commission have taken many significant steps to cope with the urban highway problems.

It is important to note that the North Carolina State Highway Commission has responsibility for over 71,000 miles of streets and highways including all primary routes, all secondary or county roads, and approximately 30 per cent of all highway and street mileage within the municipal corporate limits. Actually, the Highway Commission is responsible for a greater portion of the total mileage within the urban areas since it is responsible for all streets and highways outside the municipal corporate limits.

The urban highway problem is complex and difficult to analyze. As a point of beginning: it is obvious that in each city and town there is a mutual responsibility—that of the State Highway Commission for its highway system and that of the city for its urban street system.

The need for improved street facilities in the urban area is directly related to the population that will live in and around the city, directly related to where this population might live, and directly related to the location and magnitude of business and industrial development. Since the urban highway system has a profound impact on land use, on patterns of urban growth, on the economy of the urban area, and even on the day to day personal life of persons who use the highways and who live or work near it, it is essential that the planning for the thoroughfare system must be tied closely with the over all planning program of the urban area. The thoroughfare system must be based on a sound land development plan, and vice versa. If the urban highway is planned prior to the occurrence of urban type development, highway costs can be minimized through judicious use of urban planning controls such as subdivision and zoning regulations, future street lines, etc. A thoroughfare plan provides the needed unit or identity of purpose which permits municipal improvements and state improvements to proceed constantly toward a common goal.

To a large degree, the planning approach depends upon an acceptance, by both the state and the cities, of the fact that the development of an efficient urban highway transportation system must take place in stages over the years. Further, that if such a system is to move from a "paper-plan" to actual development of expressways and major streets, city-state cooperation and coordination must be a continuing day-by-day activity.

The recognition by the local municipalities of this need for close cooperation in the planning and development of adequate urban street systems and the willingness of the municipalities to cooperate fully in the planning and development of the urban street systems have greatly attributed to the success of our planning legislation.

Therefore, in 1958 the North Carolina State Highway Commission joined with the cities in developing cooperatively long-range thoroughfare plans and in sharing the costs for developing these plans on a fifty-fifty basis. At the same time a legislative municipal study commission was working on this same urban highway problem. As an outgrowth of their study (made in cooperation with the University of North Carolina Institute of Government, the North Carolina League of Municipalities, and the State Highway Commission) legislation was introduced in the 1959 North Carolina General Assembly which required urban highway planning, stipulated that such thoroughfare plans should be the basis for state or city street construction, and indicated that such plans should be jointly adopted by both the city and the State Highway Commission to provide continuity in all future street and highway improvements.

More specifically, the major points of this legislation are as follows:

A. *Responsibility for streets inside municipalities:* The responsibility for streets and highways inside the corporate limits of municipalities is defined as follows.

1. The State Highway System—The State Highway System inside the corporate limits of municipalities shall consist of a system of major streets and highways necessary to move volumes of traffic efficiently and effectively from points beyond the corporate limits of the municipalities through the municipalities and to major business, industrial, governmental and institutional destinations located inside the municipalities. The State Highway Commission shall be responsible for the maintenance, repair, improvement widening construction and reconstruction of this system. These streets and highways within the corporate limits are of primary benefit to the state in developing a state-wide coordinated system of primary and secondary streets and highways, but many of these streets and highways also have varying degrees of benefit to the municipalities. Therefore, the respective responsibilities of the State Highway Commission and the municipalities for the acquisition and costs of rights-of-way for State Highway System street improvement projects shall be determined by mutual agreement between the Commission and each municipality.

2. The Municipal Street System—In each municipality the municipal street system shall consist of those streets and highways accepted by the municipality which are not a part of the State Highway System. The municipality shall be responsible for the maintenance, construction, reconstruction, and right-of-way acquisition for this system.

B. *Development of a coordinated street system:*

1. Each municipality, with the cooperation of the State Highway Commission, *shall* develop a comprehensive plan for a street system that will serve present and anticipated volumes of vehicular traffic in and around the municipality.

The plan shall be based on the best information available including, but not limited to, population growth, economic conditions and prospects, and patterns of land development in and around the municipality, and shall provide for the safe and effective use of streets and highways through such means as parking regulations, signal systems, and traffic signs, markings, and other devices. The State Highway Commission may provide financial and technical assistance in the preparation of such plans.

2. After completion and analysis of the plan, the plan may be adopted by both the governing body of the municipality and the State Highway Commission as the basis for future street and highway improvements in and around the municipality. As a part of the plan, the governing body of the municipality and the State Highway Commission shall reach an agreement as to which of the existing and proposed streets and highways included in the plan will be a part of the State Highway System and which streets will be a part of the municipal street system.

3. Either the municipality or the Commission may propose changes in the plan at any time by giving notice to the other party, but no change shall be effective until it is adopted by both the Commission and the municipality governing board.

C. *Acquisition of rights-of-way:*

1. When any street construction or improvement projects are proposed on the State Highway System in and around a municipality, the State Highway Commission and the municipal governing body shall reach agreement on their respective responsibilities for the acquisition and costs of rights-of-way necessary for such project or projects. In reaching such agreement, the State Highway Commission and the municipality shall take into consideration:

a) The relative importance of the project to a coordinated state-wide system of highways.

b) The relative benefit of the project to the municipality.

c) The degree to which the cost of acquisition of rights-of-way can be reduced or minimized through action by the municipality and/or the State Highway Commission to acquire all or part of the rights-of-way for proposed projects well in advance of construction of such projects.

2. Whenever a municipality agrees to acquire rights-of-way for a State Highway System street improvement project, the State Highway Commission may agree to reimburse the municipality in whole or in part for expenditures made by the municipality to acquire such rights-of-way.

3. In the acquisition of rights-of-way for any State Highway System street or highway within municipal boundaries, municipalities shall be vested with the same authority to acquire such rights-of-way as is granted to the State Highway Commission.

4. In the absence of an agreement, the State Highway Commission shall retain authority to pay the full cost of acquiring rights-of-way where the proposed project is deemed important to a coordinated State Highway System.

5. Either the municipality or the State Highway Commission may at any time propose changes in the agreement

setting forth their respective responsibilities for right-of-way acquisition by giving notice to the other party, but no change shall be effective until it is adopted by both the municipal governing body and the Commission.

This far-reaching legislation was adopted in 1959 by the General Assembly, and today the Highway Commission is cooperating in more than 50 joint thoroughfare planning studies with our municipalities. Sixteen of our urban areas have thoroughfare plans which have been mutually adopted by the Highway Commission and the respective municipal governing body.

Basically, there are two general procedures which have been followed in the preparation of thoroughfare plans for mutual adoption by the municipality and Highway Commission. One of these procedures is the development of the thoroughfare plan by the municipality with its own staff or through the use of its own consultant. The other procedure has been the development of plans through the joint cooperative efforts of the municipality and the Highway Commission.

The municipalities which already have thoroughfare plans or which prefer to develop their thoroughfare plan may submit their plans, along with substantiating data, to the Highway Commission for mutual adoption. Prior to adoption the Commission has its staff review the plan and, if necessary, work cooperatively with the municipality in making any necessary revision. In this procedure the Highway Commission would not participate directly in the cost of developing the plan; however, it could provide certain specialized services and data.

The municipalities which wish to develop cooperatively a thoroughfare plan may initiate the development of a plan by notifying the Highway Commission of their desire for a thoroughfare plan and their willingness to participate in the development of a plan. The staff of the Highway Commission would then make an analysis of the urban area to determine the magnitude and complexity of the problem, to determine the amount of work required, to determine whether a consultant may be employed for this work, and to determine the approximate cost for preparing the plan. Once this analysis has been completed a mutual agreement is executed which outlines the work to be done, who is to do the work, tentative starting and completion dates, and the respective cost participation by the municipality and the Highway Commission. Once this agreement has been made, preparation of the plan follows as scheduled in the agreement. These plans are first developed without regard to whether the proposed arterial routes should be a Highway Commission responsibility or a city responsibility. The plans are developed and adopted based upon the needs for the area and then, as a second part of the statute, the city and the state sit down and determine which of these proposed or future improvements will be a part of the city or municipal street system. This determination is based upon the language of the general statutes which indicates that the Highway Commission is responsible for providing efficient traffic service to move traffic from beyond the city limits through the city and to major business, commercial, and industrial destinations. In essence, the state's responsibility might be considered as a major arterial or expressway system with the city's responsibility being for the minor thoroughfares, collector streets, residential streets and purely business or industrial streets.

Since it is axiomatic that success in state highway planning can be achieved only if the planning operation has overall responsibilities for coordinating the planning on all highway systems under the jurisdiction of the State Highway Department, the North Carolina State Highway Commission established on the administrative staff level the "Advance Planning Department" and charged it with the following responsibilities:

1. The establishment of criteria defining the desirable levels of traffic service which should be provided on the various types of primary and urban systems.

2. The development and continual updating of a long-range, 15-year plan for the improvement of the primary and urban highway system.

3. The initiation of short-range highway construction programs to be considered by the Highway Commission.

4. The establishment of the basic philosophy, design, and location criteria of projects approved for construction by the Highway Commission.

5. The development, on a cooperative basis, of thoroughfare plans with all of the cities and towns of the state.

If such a department is to be responsive to urban problems its staff must be competent in urban planning, expressway and thoroughfare planning, in rural primary highway planning, and must be able to coordinate these activities. The Advance Planning Department is headed by an advance planning engineer who is experienced and competent in all the aforementioned areas. He has three staff assistants—a rural transportation planning engineer, an urban transportation planning engineer, and a qualified city and regional planner.

These staff personnel supervise some 12 project engineers, who have backgrounds in transportation engineering, transportation planning, urban and land planning, land economics, and statistics. For the most part these project engineers have been given an extensive in-service training program so that they have as boad an understanding as possible of planning, economics, highway design, and related disciplines.

The general concept in the development of this department was to bring as many disciplines as possible to bear or any specific project or thoroughfare plan. It is hoped that the staff of this organization would, through their close association, develop a breadth of thinking so that they would be able to analyze any specific problem in terms of its economic, social, planning and engineering facets and to seek a solution within the context of comprehensive planning.

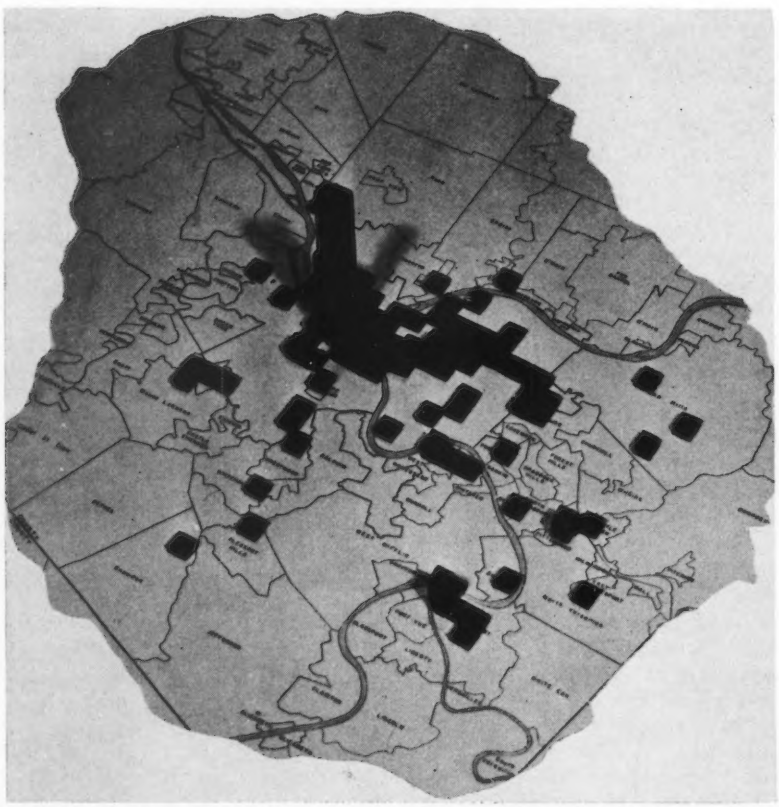
Although it will be many years before thoroughfare plans are completed and adopted in all our cities, experience has proven that it is the only logical approach to the solution of the urban highway problem. Prior to the approval of highway projects in urban areas, the Highway Commission has insisted that long range thoroughfare plans be developed. These plans set forth the basic needs for a coordinated and adequate urban street system. They bring about a mutual understanding of the local urban highway problems and pave the way for municipal-state coordination in solving these problems. Such plans allow the city and the state to work cooperatively in the acquisition of rights-of-way far in advance of roadway construction, to work with subdividers and other developers so that future major arteries of travel can be laid out before expensive buildings occupy the land, and to assure continuity and long life to urban highway projects.

The long range thoroughfare plans also help to answer many questions

(Continued on page 42)

If All Transit Service Were Stopped

By Louis E. Keefer
Study Director,
Pittsburgh Area Transportation Study



This stick model shows the 473,750 transit trips in the 420 square-mile study area by quarter-square mile destination "grid." Stick height is proportional to the number of trips; only grids with 1,000 or more transit trip destinations are shown. The four center sticks show the approximately 75,000 weekday trips to the Golden Triangle. These represent the real problem "if all transit service were stopped."

TABLE 1

Car Ownership Characteristic	Golden Triangle Trips	School Trips	Other Trips	Total Trips
No Car	48,470	13,529	77,670	139,669
One Car	90,361	108,261	75,734	274,356
Two or More Cars	16,732	30,769	12,224	59,725
Total	155,563	152,559	165,628	473,750

MUCH OF THE CONTROVERSY over the comparative advantages of mass transportation vs. highways revolves around mass transportation's claims to greater "efficiency." It is obvious that efficiency comparisons between highways and transit routes must be in equal terms. Either both must show real loadings or both must show capacity loadings. The next question is where and when? At the extreme, a comparison of system against system during a typical weekday might be most illuminating. The question may be posed: "If all transit service were stopped, how many more highways would be needed?"

An answer to this question can be found, in a rather hypothetical way, by the following arithmetic exercise involving factual data from the Pittsburgh Area Transportation Study. Another result, of course, might follow in another area.

The 1958 home interview survey collected 473,750 transit trips, of which 468,080 were by bus and streetcar, and 5,670 by railroad. There was no rapid transit system. These trips can be broken down into three more or less homogeneous groups. There were 155,563 trips with either origin or destination in the central business district (Golden Triangle), 152,559 trips with either origin or destination at a school, and 165,628 trips representing all others. These may be further broken down according to the number of cars owned in the tripmakers' households, as in Table 1.

Assume a complete conversion of all transit trips to auto trips: Using the 1958 study area average auto loading factor of 1.48 persons per auto, the 1958 study area average airline transit trip length of 2.92 miles, and an air-

line-to-over-the-road distance conversion factor of 1.4 (from theoretical studies), it may be calculated that 1,308,577 vehicle-miles of travel would be added to the 1958 study area total of approximately 10,000,000 daily vehicle-miles of travel (473,750 ÷ 1.48 × 2.92 × 1.4).

At the same time, however, an estimated 80,000 vehicle-miles of travel by bus and streetcar would be saved. Since each bus or streetcar is the equivalent, in terms of capacity used up, of five autos, the real saving is about 400,000 vehicle-miles of travel. (Vehicle equivalents may range from 2:1 on uncongested, level, tangent roadways to upwards of 10:1 on congested, winding grades, depending as well upon the number of passenger stops made. An equivalent of 5:1 is a conservative average weight for buses and streetcars for capacity measurements.) The net increase in highway travel, therefore, would be around 900,000 vehicle-miles. This would be an increase of 7.5 per cent of the 12,000,000 daily vehicle-miles of auto-equivalent travel in the study area on a typical weekday.

Now assume a more realistic, probable conversion of transit trips to auto trips, and deal separately with each of the three major types of transit trips beginning with school trips: Of 152,559 trips to or from school, about two-thirds would continue to be by school bus. This is an efficient type of transit which parents are unlikely to agree to do without. Moreover, since it is financed and operated on a different basis than are common carriers, its cessation is not implied in the question, "If all transit service stopped?"

This would leave about 52,000 school trips to be accommodated by other means. Such trips are quite short—28 per cent are less than one airline mile; 68 per cent are less than two airline miles. All school trips by transit average 1.87 airline or about 2.6 over-the-road miles. This suggests that a large number of children who now ride could walk. Others could be picked up by neighboring parents (on a turn-about-is-fair-play basis), ride bicycles, or hitchhike. Although Table 1 shows that a smaller proportion of school transit trips start from homes without cars than start from homes with two or more cars, it is unlikely (except for high school juniors and seniors, and college students) that a significant portion of the 52,000 trips could become auto trips for lack of automobile ownership or availability. It might suffice to say that only half of these trips will appear on the streets as auto trips, and that an average loading factor of 1.5 persons per car would be conservative. This would result in an increase of 45,378 vehicle-miles of travel (26,000 ÷ 1.5 × 1.87 × 1.4).

Of 155,563 trips to or from the Golden Triangle, Table 1 shows that 48,470 are by persons from households with no car. Because CBD trips are long (averaging 4.12 airline miles), it is impractical to consider that many could become walking or bicycle trips. Hitchhike trips are not altogether farfetched, however. During prolonged transit strikes, colored arm bands and other signals have been used to identify trip desires to certain areas, and hitchhiking has been more or less formalized. Where none of these alternates exist, taxis, car rentals, or car purchases would be mandatory (or a change in employment location), since about 66 per cent of transit trips to the Golden Triangle are for a work purpose.

However, except for work-oriented trips it would not be surprising to find that if transit stopped an economy of trip making would occur in one or several ways: 1) Several separate downtown transit trips for any other purpose such as personal business, shopping, or social-recreation could be combined into a single once-a-week trip as an occasional auto passenger; 2) downtown transit trips could be redirected to other places able to satisfy the tripmaker's need (should this prove feasible, a net economic gain for the individual might result).

But actually, almost two-thirds of the 155,563 downtown transit trips are work-oriented (100,126 trips). Many of these could be accommodated by greater car-pooling. Analysis shows that persons staying downtown for as long as 7-8 hours formed car pools (if you will) of 1.86 persons per car. It may be reasonable to say, therefore, that with no transit service available, the 100,126 work trips will be converted to auto driver trips at an average loading of 2.0 persons per car. This would create an additional 301,379 vehicle-miles of travel (100,126 ÷ 2 × 4.3 × 1.4).

Of the 165,628 other transit trips, 63.6 per cent or 105,339 are work-oriented. Somewhat the same reasoning as above would apply here, although the readjustment to other modes would be more difficult because of the more widely scattered destination and time patterns. These would also make higher-than-average car loadings unlikely. Because the work trips are fairly short, the changeover would create only 196,633 additional vehicle-miles of travel (105,339 ÷ 1.5 × 2.0 × 1.4).

Throughout this discussion there is the question of whether the additional cars needed would be available (about 80 per cent of the cars registered in the study area were reported as having been used every day at some time or other). There is also the serious question of whether the former users of transit service could drive the additional cars if they were available (only 29.6 per cent of all transit riders reported that they were licensed). Table 2 shows some characteristics of transit tripmakers as compared to all tripmakers together, including transit. These characteristics suggest an even more conservative changeover than predicted.

As they were predicted, however, the sum of these three more probable estimates is 543,390 vehicle-miles. Subtracting the auto-equivalent of the bus and streetcar travel saved leaves a net addition of only 143,390 vehicle-miles. This is a mere 1.2 per cent of the total auto-equivalent travel in 1958.

If all transit service were stopped, therefore, there would be between 1.2 and 7.5 per cent more travel on the highways of the area. If the midpoint of these estimates is taken, as a compromise for discussion, how important, in terms of highways needed, is a 4.4 per cent increase in travel? If it were evenly distributed in time and space, it would not be very important. Travel increases at a rate between two and three per cent per annum in urban areas. An increase of 4.4 per cent might not be as noticeable as the change between 1958 and 1960.

It is quite true, however, that the increase would not be evenly distributed. It would be highly concentrated in time (as shown by the next-to-last item in Table 2) and space (a third of all transit trips are to or from an area of only one-half square mile). Still, aside from the Golden Triangle, it can be asserted that the additional auto travel would be flexible enough to adjust to the available supply of highways; no new highways would be required for "other" or "school" transit

TABLE 2

Characteristics of Transit Trips

	Transit	All Modes
Male	44.6%	59.4%
White	92.1	95.5
Non Auto Drivers	70.4	31.5
Under 16 Years Old	24.1	11.1
Over 65 Years Old	5.9	4.3
Going To Or From Work	43.7	40.0
Going To Or From School	32.4	9.0
Trips In 4 Peak Hours	56.0	39.5
Going To Or From Central Area	32.9	20.0

trips. These are geographically dispersed, except for several smaller central business districts in other parts of the study area. Because of the relatively small amount of vehicle-miles of travel represented, conversion of these to auto driver trips would present no insurmountable peak-hour capacity problems, although local parking space shortages might be severe.

The real problem would result in the Golden Triangle and its approaches. The 24-hour "design" capacity of all streets and bridges entering the Triangle in 1958 (inbound only) was about 85,000 auto-equivalents. The 11 per cent peak hour built into this would provide for about 9,350 autos, or about 14,000 persons at an average loading of 1.5 persons per auto. (Design capacity is quite conservative and implies a high quality of service.) Of course, this is far below the number that needs to be accommodated.

Trip survey data for 1958 shows that about 43,000 persons entered the Triangle between 8 and 9 a.m. by all modes. If all persons came by auto, there would be about 29,000 autos trying to funnel through a 9,350 vehicle bottleneck. If maximum capacity is taken to be 20 per cent greater than "design" capacity, the funnel becomes about 11,220 vehicles wide. This means that an adjustment would be required in a) times of arrival or b) car loadings. While often suggested, staggered work hours will probably never be widely adopted, so a time adjustment cannot be considered practical. An increase to 2.0 persons/car would not remedy the problem; nor would an increase to 3.0 persons/car; an increase to 4.0 persons/car would be needed. This is possible but improbable (might high loadings be made a condition of entry?).

But where would the approximately 5,000 additional autos be parked? Downtown parking capacity is now about 18,000 spaces, plus perhaps 4,000 spaces near, but outside, downtown. While additional spaces could be provided by an aggressive public policy and significant investment of funds, would this be an economical use of land and money?

The question of economical investment is at the very bottom of the whole controversy over mass transportation vs. highways. There are those who say that transit represents the best bargain—although there is little evidence to prove this viewpoint. There are those, also, who say that even if it isn't, there are enough advantages to warrant a deficit operation. This is where very careful logic, not vehemence, is needed. In reflective moments, even the most violent partisan should be honest enough to admit that his opposite number has some valid points.

It is very clear, for example, that transit operations involve providing service at off-peak as well as peak hours. This means unused seats. Moreover, even in peak periods, only those vehicles traveling in the dominant direction of demand are likely to have full loads and then only part of the way to their turnaround. With the best scheduling possible, then, any transit operating company must offer many more seat-miles of service than it knows will be used. In the Pittsburgh area, the eighth largest metropolitan area in the United States, there were 4.9 million seat-miles scheduled and only 1.9 million used on a typical weekday in 1958. The Chicago Area Transportation Study found a similar ratio for the Chicago area in 1956. It is hard to see how these "inefficiencies" can be reduced very much.

At the same time, it would be most difficult to say whether, if all transit service were stopped, a net savings in the total cost of transportation would result. Data from the Pittsburgh area are suggestive. There would be between 1.2 and 7.5 per cent more vehicle-miles of travel in the study area; this could probably be accommodated by the existing highway system (with some tugging and pulling) only *if* each auto trip to the Golden Triangle included three passengers and only *if* about 5,000 new, all-day parking spaces were provided. Since car loadings of this magnitude are most improbable, it may be concluded that several major highways into the Golden Triangle would be needed, along with the additional parking spaces. The cost of providing these might well be less than the cost of operating transit.

But for that matter, there are many to whom a decision based on comparative cost advantages would be objectionable. The eloquence of "pro-transit" writers is all the more appealing because so many thinking persons find obvious faults with an auto-dominant society, pointing to usurption of land for highways, urban sprawl, and poisonous exhaust fumes as consequences. The implication is that if more persons used transit these conditions would not exist.

This article shows, in effect, that if transit usage in the Pittsburgh area ***doubled***, there would still be an auto-dominant society. In the viewpoint of this writer, neither those who object to this result, nor those who view it with indifference, should cloud the issue with immodest claims of superior "efficiency" for a particular travel mode. This article has intended to do no more than add a new perspective to the question—on a system against system basis. Hopefully, its implications will be studied with professional care.

Seems as if nothing works out right these days. In a town where you can park as long as you want to, you don't want to.

If your wife insists on driving, don't stand in her way.

Mechanic, to owner of old, broken-down car: "Let me put it this way—if your car were a horse, it would have to be shot."

Park-and-Ride In Switzerland

By Bruno Wildermuth
Traffic Engineer, Zurich Section,
Touring Club of Switzerland

At the end of November 1960 the Zurich Section of the Touring Club of Switzerland approved the necessary funds for a new action park-and-ride. This decision was made in view of the upcoming shopping days for Christmas and the continuous shortage of parking spaces in the downtown area of the City of Zurich.* (The shortage amounts to about 10,000 parking spaces). The Touring Club, the City Police Department and the Department of Public Transportation agreed on a joint effort to provide a shuttle bus service for motorists from two parking lots along the lake to the downtown area.

Already the past summer the Department of Public Transportation had tried a similar service with small buses from a large outskirt-parking field to the main railroad station in the CBD. There was no success however to that summer experiment which lasted 140 days. The following factors it was said had been working against any success.

1. The parking lot was too far away (3.3 miles) from the critical zone of the CBD and it was not even adjacent to a main arterial highway.

2. To reach the parking lot it was necessary to turn left from a busy street.

3. The bus fare was too high (55 cents (U.S.) round trip).

4. The buses could not reach the downtown area any faster than other vehicles could.

5. Due to traffic jams, the passengers very often had to wait up to 20 minutes for a bus.

6. This service was not well enough known in the region of origin of the traffic in question.

If park-and-ride were given a new test which should lead to any definite conclusion all the above mentioned factors had to be considered.

After not more but four days of operation it was possible to start service the first Saturday in December only with the great effort of all the participating departments, the Police providing the signing, the Public Transportation having small buses and drivers ready and the Touring Club managing the advertisement.

The Parking Lots "Harbour Enge" and "Mythenquai Beach"

These two parking lots are located along the right side of a major arterial highway carrying up to 20,000 vehicles a day and connecting the southern and south-western regions with the city. The lot at the Enge Harbour serves during summer time as parking facility for the many tourist buses. It lies outside, but just adjacent to, the critical zone of the downtown area. Since a few years visitors to the CBD are parking their cars here in view of the fact that the next lot about 1000 feet closer to the CBD is filled daily after 8:30 a.m. The stall markings for tourist buses were replaced to accommodate 130 passenger cars (47 spaces at right angle parking and 83 spaces in three rows of parallel parking). A stop of the next streetcarline is located about 1500 feet away from the parking lot but does not provide direct access to the business area.

The lot at the Mythenquai Beach is used only by the visitors to the beach during summer time. This lot provides parking for 190 passenger cars all with angle parking. It is located 1300 feet further south of the first one and therefore more than half a mile away from the streetcar stop.

The Buses Used

The Department of Public Transportation used for the first test two VW 8 passenger buses. For the extremely heavy traffic on December 8th an additional Ford-Taunus 9 passenger bus was rented. The right side driving of the VW buses was not very useful since

*With a population of 440,000, Zurich is the largest city in Switzerland. Its metropolitan area includes some 625,000 people; 86,000 people are working in the downtown area which also gets some 180,000 daily visitors.

front-seat passengers had to enter and leave the bus at the traffic side.

The Bus Stops

At both parking lots the stops were located at the entrance to the lot. At the Harbour Enge the passengers returning from the downtown area had to leave the bus on the opposite side of the arterial highway; however there was a zebra crosswalk right next to the stop for safe crossing. At the Mythenquai Beach the stop to enter and leave the bus was located inside the parking lot since this was the turning point of the bus. The only stop in the business area was located at a large office building from which the arcades extended over the stop to allow rainproof charge and discharge of the passengers.

Times of Operation

During the month of December 1960:

Every Wednesday afternoon (all grade- and high schools off)—1.00 p.m. till 7.00 p.m.; every Friday afternoon (Stock exchange)—1.00 p.m. till 7.00 p.m.; every Saturday—9.00 a.m. till 6.30 p.m.; in addition on Thursday, 12.8.1960 (holiday for the southern and southwestern regions outside of Zurich)—9.00 a.m. till 8.00 p.m.

Store closing hours are 6.30 p.m. during weekdays and 5.00 p.m. on Saturday.

It was first scheduled to run a bus every 10 minutes, but it was found to work more effectively if buses would run whenever they had loaded passengers. This way it was possible to maintain a 7½ minute schedule during rush hours.

Bus Fare, Parking Fee, Travel Time

The fare for a one way ride amounted to about 8 cents (U.S.) which is equal to the parking-meter charge for one hour. There was no charge for children unless they occupied a seat for themselves.

Parking was unlimited and no parking fee was charged.

The travel time varied between 6 and 9 minutes depending on the traffic conditions.

Area of CBD Served by the Service

From the bus stop in the CBD the "Bahnhofstrasse," Europe's famous shopping street could be reached in two walking minutes. Within 10 walking minutes one could get to any of the city's department stores.

TABLE 1

Date	Day	Hours of Operation	Number of Passengers	Number of Trips	Passengers Per trip
12. 3.60	Saturday	9.00 am—6.30 pm	97	18 each way	2.7
12. 7.60	Wednesday	1.00 pm—7.00 pm	72	26 each way	1.4
12. 8.60	Thursday	9.00 am—8.00 pm	904	118 each way	3.8
12. 9.60	Friday	1.00 pm—7.00 pm	53	21 each way	1.3
12.10.60	Saturday	9.00 am—6.30 pm	350	59 each way	3.0
12.14.60	Wednesday	1.00 pm—7.00 pm	102	16 each way	3.2
12.16.60	Friday	1.00 pm—7.00 pm	43	19 each way	1.1
12.17.60	Saturday	9.00 am—6.30 pm	337	52 each way	3.2
12.21.60	Wednesday	1.00 pm—7.00 pm	66	34 each way	1.0
12.23.60	Friday	1.00 pm—7.00 pm	22	23 each way	0.5
12.24.60	Saturday	9.00 am—6.30 pm	90	27 each way	1.7
12.30.60	Friday	1.00 pm—7.00 pm	10	5 each way	1.0
12.31.60	Saturday	9.00 am—6:30 pm	9	6 each way	0.8

Propaganda

Three days before service started the whole press of the City of Zurich and the regions south and southwest, as far as 40 miles from the city, had received a communiqué. Four days in advance of the Catholic holiday the editors of the same newspapers were asked at the phone to repeat the announcement of the bus service. The day before the holiday the Swiss National Broadcasting Corporation made an announcement at the times of their noon and their evening news. The city's department stores carried notes on the park-and-ride service in their ads. After 10 days of service a press conference was held and the first results released. Earlier Radio Zurich had given exclusive attention to the service in one of its most popular broadcasting.

Passenger Using the Service, Numbers of Trips

The number of people who has been taking advantage of the service can best be seen from Table 1. Only the two typical shopping Saturdays and the day of the Catholic holiday showed a satisfactory use of the bus service. The fact may be mentioned that on December 8th (holiday) several dozens of people were forced to walk to the downtown area because there were not enough seats available on the two buses. Even after we had put a third bus in operation the service did not function without some waiting-time. This meant that most people had to wait for the next bus until they could get a seat. Nevertheless this wasn't too bad since we could run the buses at a five minutes' interval.

During a total of 100½ hours of operation we carried 2155 passengers on 848 trips. There were 2.54 passengers per trip or 21.44 passengers per hour of operation.

Since the buses were running whenever any passenger arrived there is some relation between the number of trips and the number of passengers. With less passengers we had to make more trips. Even on the best day the number of passengers per trip hardly reached four. This is a result of the fact that very seldom we could carry people in both directions at the same time. After any trip made with a filled bus we had to make the journey back with an empty one.

Parking Usage

On December 8th and 17th special field checks concerning the usage of the parking spaces were conducted.

December 8th: Harbour—available 131, used 131, parked cars 244, cars per space 1.86; Beach—available 191, used 191, parked cars 238, cars per space 1.25; Nearby city streets—parked cars 69. Total parked cars 551.

On December 8th the Harbour lot was filled at 10.15 a.m. Until 5.00 p.m. there were always at least 115 cars on that lot. The Beach lot was filled at 2.20 p.m.

December 17th: Harbour—available 131, used 87, parked cars 163, cars per space used 1.87; Beach—available 191, used 16, parked cars 26, cars per space used 1.62. Total parked cars 189.

It was very interesting to note that the Harbour lot was always occupied first. Only if the Harbour lot was filled people would drive back to the lot at the Beach. This was so despite the fact that in both lots, bus fare and travel time were the same because the buses served both parking lots. We assume

TABLE 2

Duration of parking

Lot	Date	up to 2 hrs.	2-3 hrs.	3-4 hrs.	Less than 4 hrs.	4-5 hrs.	5-6 hrs.	6 hrs. and more
Harbour	12.8.	13.1%	25.4%	18.0%	56.5%	11.9%	7.0%	24.6%
Harbour	12.17.	23.9%	35.6%	17.8%	77.3%	10.4%	6.8%	5.5%
Beach	12.8.	16.5%	33.5%	18.3%	68.3%	13.8%	9.4%	8.5%
Beach	12.17.	19.2%	46.2%	11.5%	76.9%	19.2%	3.9%	—
Both	12.8.	14.7%	29.3%	18.2%	62.2%	12.8%	8.1%	16.9%
Both	12.17.	23.3%	37.0%	16.9%	77.2%	11.6%	6.4%	4.8%

that the people just want to drive as close as possible to their destination. This seems to have a psychological reason—at least it could not be a materialistic one.

Possibilities for Park-and-Ride

This test clearly showed that the people of Zurich like the idea of park-and-ride only for some typical shopping days but did not make any use of it on other days. Interviews with the users of the service as well as the results of the test led to the conclusion that only visitors to the city and only on days of heavy traffic do people like to park their cars outside the central area and ride a bus.

Park-and-ride could therefore be very useful for some special purpose like popular shopping days and days which are holidays for other regions of the country to prevent the city's traffic from a complete breakup. As a regular service however it does not seem popular enough yet.

Final Conclusions

The service during December 1960 has been partly successful; especially as a test it was of high value. The results show that in Zurich Park-and-Ride under certain conditions could work well. On the other hand it also proved that this system did not yet work as a daily service. It would only have a chance to become a daily service if the commuters to the downtown area would start to use it. This however might be soon, as soon the still available free unlimited parking in the downtown area will have to be converted into metered parking and in other areas close to the CBD there will no longer be a chance to find a free parking space.

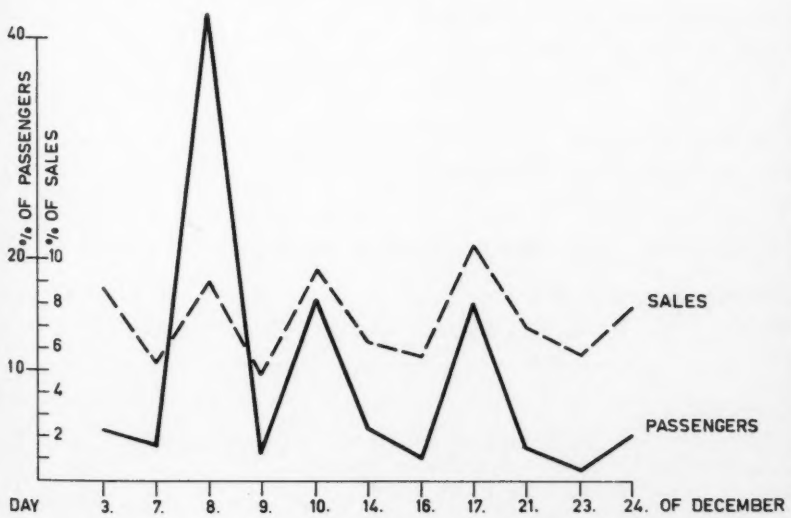


Figure 1

Comparison: Bus-passengers and sales. The almost direct relationship of the two curves shows clearly that there must be a relationship between traffic and sales. It also proves park-and-ride service was popular only among visitors but not among daily commuters. If any further park-and-ride service should go in operation one could select from the sales statistics the days which could bring reasonable patronage. (Sales statistic from Zurich's largest department store "Jelmoli.")

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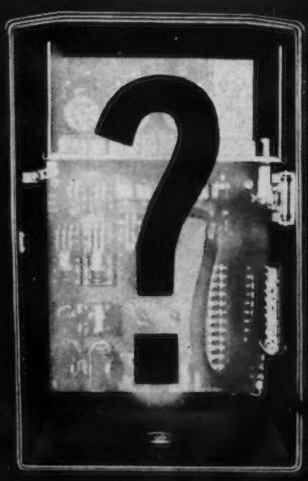

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Monday, August 21

Morning . . . . . Opening General Session, 31st Annual Meeting, Institute of Traffic Engineers
Noon . . . . . Opening Luncheon
Afternoon . . . . General Session
Evening . . . . . Get-Acquainted Party

Tuesday, August 22

Early Morning . Biscuit Banter Breakfast (men)
Morning . . . . . Departmental Sessions
Afternoon . . . . ITE Business Meeting (members)
Sightseeing Tour (non-members)

Wednesday, August 23

Morning . . . . . Technical Committee Meetings
White House Tour for Ladies (limit of 400)
Afternoon . . . . Departmental Sessions
Evening . . . . . Reception and Banquet

Thursday, August 24

Morning . . . . . Opening General Session, International Sessions in Traffic Engineering
Afternoon . . . . General Session

Friday, August 25

Morning . . . . . General Session
Afternoon . . . . General Session

Saturday, August 26

Morning . . . . . General Session
Afternoon . . . . General Session; Closing

Sunday, August 27

All Day . . . . . Sightseeing Tour of Metropolitan Area

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Make reservations directly with the hotel of your choice.

Early planning is essential in view of the many special events and unusual features of this meeting. Family attendance is encouraged — plans are being made for many wives and children.

Vehicular Signal System Committee Meets

Representatives from 11 organizations met in Washington in April to plan for the future activities of the recently formed joint committee which is exploring ways and means to develop a vehicular signal system.

The Chairman of the group is Mr. E. R. Ricker, the representative of the Institute of Traffic Engineers. Others present at the meeting and the organizations which they represent are as follows: O. L. Anderson, M.D., American Medical Association; L. L. Beltz, Automobile Manufacturers Association; L. E. Bender, American Bridge, Tunnel and Turnpike Association; B. R. Creighton, American Association of Motor Vehicle Administrators; R. R. Hume, International Association of Chiefs of Police; B. W. Marsh, American Automobile Association; G. E. Meese, Society of Automotive Engineers; A. V. Monto, M.D., Public Health Service; J. F. Parker, American Psychological Association; R. P. Teele, Illuminating Engineering Society.

One of the major accomplishments of the meeting was the adoption of the following purpose and scope of the committee.

Purpose

To develop or to promote the development of an improved vehicular signal system to meet modern traffic needs and to attain optimum efficiency and safety in highway transportation by:

1. Definition and appraisal of the essential functions of practical systems for highway user communication, taking due account of the existing situation, of present technical standards, projected plans and refinements now in development, and available knowledge of pertinent human factors.

2. Establishment and operation of a clearing house to keep abreast of significant investigations and research bearing on the evolution of vehicular signal systems, and to provide appropriate recommendations and assistance for needed research.

3. Formulation of sound principles upon which a comprehensible, uniform vehicular signal system should be based.

4. Planning, development and support of adequate steps for the purpose of securing adoption of an improved vehicular signal system for both new and existing vehicles.

Scope

The Committee will direct its activities concerning this project to the achievement of an effective vehicular signal system which will enable drivers and persons afoot to make more efficient and safer use of streets and highways. The total range of conditions encountered in highway transportation and the full range of possibilities in transmitting the agreed upon signal indications will be considered in the development of an optimum, practical system. Patterns of auditory and visual stimuli, as well as other related factors, will be explored with appropriate persons in scientific and other professions, and with highway users. A broad cooperative base will be sought for securing the adoption of the vehicular signal system.

The group also voted to designate itself as the "Joint Vehicular Signal System Committee."

Other discussion at the meeting included a review of the types of information which could be conveyed by vehicular signals and the program which is to be followed. Mr. Teele also demonstrated some of the limitations of color and arrangement that must be considered when using visual signals.

The next meeting of the committee will be held in June, the day following a demonstration of vehicular signaling to be presented by the automobile manufacturers.

Department of Urban Affairs and Housing on Cabinet Level Proposed

An Administration bill (HR 6433) to create a new Department of Urban Affairs and Housing in the cabinet has been introduced in the House of Representatives by Rep. Dante Fascell (D., Fla.), ranking majority member of the House Government Operations Committee. Identical legislation has been introduced in the Senate by Senator Joseph S. Clark (D., Pa.). The action followed a special message to Congress by President Kennedy urging enactment of the legislation.

Among its provisions, the bill calls for "the promotion of effective mass transportation within urban areas and the coordination of transportation plans with the needs of urban communities as part of the over-all planning for such communities."

The proposed legislation would abolish the Housing and Home Finance Agency, the Federal Housing Administration, the Public Housing Administration, the National Housing Council, and the offices of Housing and Home Finance Administrator, Federal Housing Commissioner, Public Housing Commissioner, Deputy Housing and Home Finance Administrator, Urban Renewal Commissioner, and Community Facilities Commissioner. Their present functions would be absorbed by the new Department.

The Bureau of Public Roads would be unaffected by the proposed measure. It would remain in the Department of Commerce.

Women's Crusade for Seat Belts Is Launched

A nationwide "Women's Crusade for Seat Belts" has been launched by the General Federation of Women's Clubs. Co-sponsoring the campaign is the Auto-Industries Highway Safety Committee.

The Crusade will be conducted through the remainder of the year by the Federation's 16,000 affiliated clubs. The goal of seat belts in more motor vehicles is summed up in their slogan: "A Million and One in '61."

Other organizations and groups cooperating in the crusade are the American Medical Association, Automotive Safety Foundation, National Automobile Dealers Association, National Safety Council, National Tire Dealers and Retreaders Association, the President's Committee for Traffic Safety, the Accident Prevention Division of the Public Health Service and automobile and tire manufacturers.

Special "Crusade Cards," provided through the courtesy of the National Automobile Dealers Association, will be used by the Federation's 16,000 clubs. The cards will carry an explanation of why the use of seat belts is important, as well as a section to be returned to Crusade Headquarters, in Washington, D. C., after seat belts have been installed. Crusade cards will also be distributed by clubwomen to individuals and other organizations to stimulate the wide-spread use of seat belts in each community.

Cards returned after seat belts are installed will be tabulated at Crusade headquarters to determine club winners in the program. Three types of awards will be made: a certificate of achievement for each club in which

all members had seat belts installed in their cars; a state award for the state in each Federation region which has the highest percentage of clubs with 100 per cent participation and a national award for the club conducting the most outstanding community activity in support of the Crusade.

Research Board Reprimands Two Associations

The Highway Research Board of the National Academy of Sciences—National Research Council announced that its Executive Committee had taken action strongly reprimanding the responsible officials of two industry associations that have prematurely and without authority, published statements purporting to contain significant results of the AASHO Road Test.

The Road Test, sponsored by the American Association of State Highway Officials and administered by the Highway Research Board, the largest and most comprehensive road test ever conducted, is a scientific study of the performance of asphalt concrete pavements, of portland cement concrete pavements, and of short-span bridges of various designs, all subjected to repeated passages of vehicles applying known loads.

At the beginning of test traffic in October 1958, it was agreed by all concerned that the true objectivity and full benefits from the project could prevail only if all parties refrained from publishing any resulting data or reports prior to their evaluation and issuance by the Highway Research Board. It was also agreed that premature or unauthorized publication of information or opinions purporting to show research indications or results on the part of any group or interests would be subject to appropriate action.

The Highway Research Board Executive Committee found that the responsible officials of the two organizations reprimanded had failed to abide by this policy and agreement.

21 States to Cooperate With Federal Driver Register

Federal Highway Administrator Rex M. Whitton has announced that 21 states and the District of Columbia have already agreed to cooperate in the National Driver Register Service to be maintained by the Bureau of Public Roads, U. S. Department of Commerce.

The Driver Register is a file of motor vehicle operators whose licenses are withdrawn for driving while intoxicated or for a conviction of a violation involving a traffic fatality. The information contained in the file will be made available to State Motor Vehicle Administrators on request in order to prevent drivers who have lost their licenses in one state from being licensed in another.

Mr. Whitton said the planning of the Register Service is progressing rapidly and State Motor Vehicle Administrators will be able to use the service shortly after July 1, 1961, when funds are expected to be available for its operation.

The states already agreeing to participate are Arizona, Colorado, Connecticut, District of Columbia, Idaho, Iowa, Kentucky, Maine, Maryland, Montana, New Jersey, New Hampshire, North Carolina, North Dakota, Oregon, Pennsylvania, Rhode Island, Tennessee, Utah, Vermont, Virginia and Washington.

Mr. Whitton also announced that he has recommended to the Congress an amendment to the Driver Register Law which will permit more states to take part. This amendment would enable states which "suspend" licenses to participate as well as states which "revoke" licenses.

The proposed amendment was an outgrowth of a conference of representatives of the American Association of Motor Vehicle Administrators, State Motor Vehicle Administrators, the American Bar Association, the Traffic Institute of Northwestern University, the Field Service of the International Association of Chiefs of Police and the Bureau of Public Roads.

W. G. Eames, Director of the Driver Register, said the file will be operated on electronic data processing equipment in the Headquarters Office of the Bureau of Public Roads, Washington, D. C. The file is expected to grow at the rate of 1,000 a day and approximately 20,000 file checks will be made each day. Most of the drivers listed in the register will be there for driving while intoxicated. This offense accounts for over half of the total license revocations throughout the country each year.

Names and identifying data to be placed in the file as well as requests for search will be accepted on hand-printed or typed forms, tabulating cards, and paper or magnetic tape. Pre-addressed envelopes will be provided to enable the State Motor Vehicle Administrators to obtain information economically from a central source without directing inquiries to all states.

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Publications List

The publications of the Institute of Traffic Engineers listed below are available from the headquarters office at 2029 K Street N.W., Washington, D.C.

TRAFFIC ENGINEERING Magazine

TRAFFIC ENGINEERING is the official monthly publication of the Institute. It contains original articles of a technical and semi-technical character dealing with traffic engineering and related subjects. It also contains digests of current traffic news of unusual interest, and personal news of members.

Subscriptions ..... $4.50 a year
Foreign Postage ..... $1.25 a year, all countries except U.S. possessions, Canada and Mexico.
Single Copies ... $0.50 each, quantities of 1 to 9.
$0.40 each, quantities of 10 or more.

PROCEEDINGS

The Annual Proceedings of the Institute contain copies of all papers presented at the Annual Meeting.

1960 Edition	$3.00	1952 Edition	out of print
1959 Edition	2.00	1951 Edition	out of print
1958 Edition	1.50	1950 Edition	out of print
1957 Edition	out of print	1949 Edition	out of print
1956 Edition	out of print	1948 Edition	0.50
1955 Edition	0.75	1947 Edition	out of print
1954 Edition	0.75	1946 Edition	0.50
1953 Edition	out of print	1939 Edition	0.50

Set of 1958, 1959 & 1960 Editions $5.00

YEARBOOK

The annual yearbook (published in February) of the Institute of Traffic Engineers, contains a brief description of the organization, copies of the Constitution and By-Laws, and a list of the members with mailing addresses.
Price $1.00 per copy.

TECHNICAL BULLETIN #1

"Adjustable Face Traffic Control Signal Head Standards."

This bulletin has been approved (October 16, 1958) as an American Standard by the American Standards Association. Price $0.50 per copy.

SUPPLEMENT TO TECHNICAL BULLETIN #1

"12-Inch Adjustable Face Traffic Control Signal Head Standards."

This supplement to Technical Bulletin #1 was approved by the Institute in January 1960. Price $0.15 per copy.

TECHNICAL BULLETIN #2

"Pre-Timed, Fixed Cycle, Traffic Signal Controllers."

This bulletin has been approved (October 16, 1958) as an American Standard by the American Standards Association. Price $0.50 per copy.

TECHNICAL BULLETIN #3

"Traffic-Actuated, Traffic Signal Controllers and Detectors"

This bulletin has been approved (October 16, 1958) as an American Standard by the American Standards Association. Price $0.50 per copy.

TECHNICAL BULLETIN #4

"A Model Performance Specification for Purchase of Pavement Marking Paint."

This bulletin was approved by the Institute in January 1960. Price $0.50 per copy.

PROPER LOCATION FOR BUS STOPS

This Technical Committee report of 1954 approved as a recommended practice has been printed as a 12-page pamphlet. Price $0.25 per copy.

INDUSTRIAL PLANT PARKING

A report of Technical Committee 6-F, approved in 1959 as a recommended practice of the Institute and reprinted from TRAFFIC ENGINEERING magazine. 8 pp.
Price $0.15 per copy.

FREEWAY OPERATIONS

This book is a report on the 12 seminars conducted during 1958 and 1959 to study problems presented by the growing mileage of controlled-access roadways. Drivers, accidents, signs, regulations, geometric design, freeway connections, maintenance, policing, and motorists' services are discussed. 88 pp. Price $1.00 per copy.
(Quantity discounts)

AUTO — USA

This pamphlet, issued as a companion piece for the film by the same name, is designed to acquaint citizens in any community with the basic requirements for carrying out a program of transportation improvement. Written in non-technical language, it is available apart from the film. 8 pp. Free.

RESEARCH TO IMPROVE TOMORROW'S TRAFFIC

A reprint of the 1957 Theodore M. Matson Memorial Award paper by O. K. Normann, Deputy Assistant Commissioner for Research, U. S. Bureau of Public Roads. 16 pp. Free.

TRAFFIC ENGINEERING IN TOMORROW'S TRANSPORTATION

A reprint of the 1958 Theodore M. Matson Memorial Award paper by D. Grant Mickle, Director, Traffic Engineering Division, Automotive Safety Foundation. 8 pp. Free.

HIGHWAY SAFETY — A PRIMARY CHALLENGE TO TRAFFIC ENGINEERING

A reprint of the 1959 Theodore M. Matson Award paper by Charles W. Prisk, Director, Highway Safety Study, U. S. Bureau of Public Roads. 4 pp. Free.

AGING AND DRIVING

A reprint of the 1960 Theodore M. Matson Award paper by Burton W. Marsh, Director, Traffic Engineering and Safety Department, American Automobile Association. 24 pp. Free.

NOTE: *Traffic Engineering* and the current *Proceedings* are sent automatically to all ITE members as part of their membership service. Single copies of technical bulletins and reprints listed above are available upon request, without charge, to all ITE members.

Driving Simulator

To study interaction of driver and vehicle control characteristics, General Motors Research Laboratories has developed this analog driving simulator as part of a human factors research program. The five horizontal bars on the oscilloscope screen in front of the driver are a simplified perspective of the road ahead, providing the same visual stimulus a driver would receive on a full-size highway.

Beneath the five horizontal bars are two short vertical bars representing a vehicle's front wheels. The five bars shift horizontally, giving the illusion of bends and turns in the road, and the driver manipulates the steering wheel to follow the road curvature.

The synthetic car is in its proper lane so long as the two vertical bars representing the front wheels stay within the outer limits of the lowest of the five horizontal bars. When the driver pushes the accelerator, the horizontal shifting of the bars speeds up, simulating increased car speed. The shifting slows down when the brake pedal is applied.

The display on the oscilloscope screen is generated by a tape transport, part of which is shown at the right being controlled by Instrument Technician Irvin D. Hill.

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TE Supplier Changes Name

Nationwide Traffic Engineering Products Corporation, of Glenside, Pennsylvania, has adopted its new name following suggestions made by a number of traffic engineers. Originally called "Nationwide Traffic Engineering Corporation," the company recognized the name did not clearly indicate the fact that the company was a manufacturer and supplier rather than a consulting firm.

The change was made, according to the company, at considerable expense, since dies and much printed material were involved. The result, it is hoped, will be to relieve the former confusion. The company has expressed its gratitude to the professional people who called attention to the need for the change.

New Catwalk Car Proposed for Tunnel Use

Field tests of a single-wheeled, 550-pound, gasoline-powered catwalk car, which have been under way since September 1960 along 3,000 feet of the south (New York-bound) tube of the Lincoln Tunnel, will be extended to the entire 8,000-foot-long tube under a $150,000 project authorized by the Commissioners of The Port of New York Authority today.

Following the construction of a prototype car, incorporating design improvements suggested by the current tests, three additional vehicles will be purchased and a guide rail installed on the remaining 5,000 feet of the tunnel catwalk. In addition, a closed circuit television system will be installed at three separate locations along the catwalk to enable Port Authority police officers to inspect those portions of the tunnel roadway beyond their direct view.

Five police officers are now stationed on the catwalk in the Lincoln Tunnel south tube during peak hours. The new system will permit three police officers, each provided with a catwalk car and a television monitor and camera, to cover the tunnel posts and expedite supervision of traffic. The saving in operating costs will total about $31,000 a year.

The results of the expanded field test will determine the number of cars, if any, that will be installed in the three-tube Lincoln Tunnel and the two-tube Holland Tunnel.

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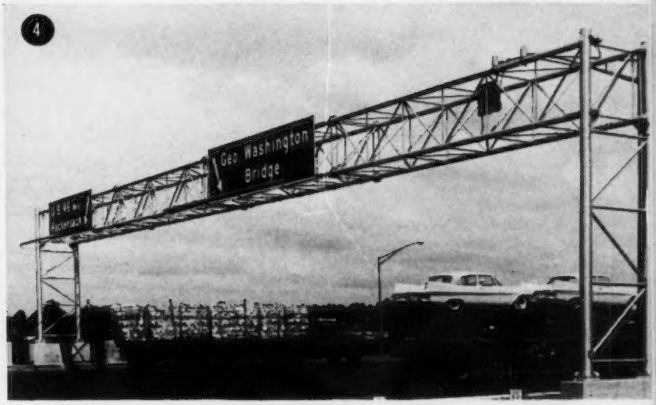

P & K all-aluminum sign spans, while meeting your most rigid strength requirements, make your dollars go farther. The natural light weight of aluminum means faster and easier installation. Notice in all the illustrations that, as a safety bonus, there is no center support, regardless of the length. This means no obstructions beneath the span, lower installation costs, yet you get all the strength you need. And, of course, every span is static load tested before shipping. Another important dollar-stretcher is aluminum's corrosion resistance... never needs painting or other costly maintenance. With P & K sign spans, your first cost is your last cost!

78 STANDARD SPANS

You'll save invaluable time by investigating the use of one of P & K's stock spans. As the originators of the aluminum truss span, P & K has developed 78 standard spans, up to 110 feet in length and designed to carry up to 600 square feet of sign. One of these will meet your requirements. For small sign areas and shorter lengths, tapered tubular spans are available. In addition, P & K has had extensive experience in the development of larger units such as the Walt Whitman span—140 feet in length, without a center support—the largest fabricated to date in aluminum and designed to carry 700 square feet of sign. For complete stock span information describe your requirements, stating span length, sign area, location, etc.

1. INSTALLATION: 88'6" aluminum box truss sign span
OWNER: Richmond-Petersburg Turnpike Authority
LOCATION: James River Bridge
CONSULTING ENGINEERS: Parsons, Brinckerhoff, Hall & MacDonald

2. INSTALLATION: 56 foot aluminum box truss signal span
OWNER: State of Michigan, Mackinac Bridge Authority
LOCATION: Mackinac Bridge, St. Ignace, Michigan
CONSULTING ENGINEERS: D. B. Steinman

3. INSTALLATION: 90 foot aluminum box truss sign span
OWNER: North Carolina State Highway Commission
LOCATION: Interstate Route 40

4. INSTALLATION: 110 foot aluminum box truss sign span
OWNER: New Jersey Turnpike Authority
LOCATION: Exit 18, New Jersey Turnpike
GENERAL CONSULTANT: Howard, Needles, Tammen and Bergendoff
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The unique catwalk car of aluminum and transparent plastic, is 20 inches wide; 6 feet, 10 inches long; and 4 feet, 7 inches high. It is equipped with an 8-horsepower engine and can be operated in either direction by means of duplicate sets of controls at speeds up to 30 miles an hour. The car rides on a single rubber-tired wheel and is guided and supported by smaller metal wheels running along a rail attached to the catwalk floor.

The present experimental car was developed for the Port Authority by research engineers of the Battelle Memorial Institute of Columbus, Ohio, who will be retained to build the new prototype vehicle.

Closed circuit television, in use since last November on the New York approaches to the tunnel to expedite traffic flow during peak periods, has also been tested successfully over the last several years inside both the Lincoln and Holland Tunnels.

ASEE Elects New Officers

Dr. Robert W. Van Houten, President of the Newark College of Engineering and Director of the Newark Technical School, has been elected President of the American Society for Engineering Education. He will serve ASEE for one year beginning July 1, 1961.

Elected Vice-Presidents of ASEE are Dr. George A. Marston, Dean of Engineering at the University of Massachusetts and Dr. Curtis L. Wilson, Dean of the Missouri School of Mines and Metallurgy. Election results returned Wendel W. Burton, of the Minnesota Mining and Manufacturing Company, to the post of Treasurer.

Perma-Line In New Plant; Under New Direction

The manufacture of Perma-Line thermoplastic striping material in the United States has been taken over by the Perma-Line Manufacturing Corporation of America, with headquarters at 750 South Clinton Street, Chicago, Illinois.

This firm was formerly known as Veon-West Corporation, and served as distributors for this material, then manufactured by Veon Chemical Corporation in New York. A series of distributors have been named around the country, including Perma-Line Midwest Corporation in the Midwest area and Broadway Maintenance Corporation in New York. Others include Traffic Engineers Supply Corporation in Alexandria, Virginia; the Perma-Line Company in Miami Beach; Traffic Appliance Corporation in Los Angeles; Traffic Supplies, Inc., in Oklahoma City; and Perma-Line Corporation of New England, in Brockton, Mass.

The executive officer of the new corporation is Morris Alexander, who has been the president of Perma-Line Midwest since its organization in 1954.

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New Appointments

Burns and Finnbogason Named by Winnipeg

Harry F. Burns (Mem., ITE) has been named deputy director of the Streets and Transit Division of the new Metropolitan Corporation of Greater Winnipeg. This is a metropolitan area government, organized on January 1 of this year, on a somewhat similar basis to the metropolitan government of Toronto.

The new government took over the transit commission on January 1 and all the metropolitan roads on May 1. The new department will be responsible for all transportation in the metro area, including the planning, design and operation of transit, metropolitan roads and traffic control. The director is Donald MacDonald, who was formerly the head of the Transit Commission.

As assistant to the deputy director, with the title of Metro Streets and Traffic Engineer, is William H. Finnbogason (Assoc. Mem., ITE). Finnbogason was in a similar position with the city before the new government took over.

Burns had been traffic engineer with A. D. Margison and Associates Limited in Toronto for the past five and a half years. Earlier he was city traffic engineer in Winnipeg. A graduate of the University of Manitoba, he is registered in Manitoba and Ontario, and is a member of the Engineering Institute of Canada.

Finnbogason, who has been with the city since 1952, is also a graduate of the University of Manitoba. He is registered in Manitoba, and belongs to the EIC.

Roy Jorgensen Enters Consulting Field

Roy E. Jorgensen (Mem., ITE) has opened his own highway management and engineering consulting services with headquarters in Chevy Chase, Maryland.

Jorgensen resigned as engineering counsel for the National Highway Users Conference, a position he held since 1951. In his new endeavor he will be retained by NHUC to direct the highway management conferences sponsored jointly by NHUC and the American Association of State High-

way Officials. In his private practice he will specialize in management reviews and guidance for highway departments, studying organization, maintenance, personnel, planning and reports.

Jorgensen served from 1947 to 1951 as deputy commissioner and chief engineer of the Connecticut State Highway Department and before that for five years as director of highway planning for the Department. Previously he spent twelve years with the Bureau of Public Roads.

A graduate of the University of California, Mr. Jorgensen is a Fellow of the American Society of Civil Engineers.

Lynn Stewart Named By California

Lynn Stewart (Mem., ITE) has been named State Parking Analyst for the State of California.

Lynn Stewart

The position of parking analyst for the state was created to implement action by the State Legislature in the adoption of the policy that the state should furnish adequate parking to meet the demands created by all state facilities, including office buildings and state colleges. The policy further directed that these facilities should be self-supporting and not be an obligation on the general fund. It is likely, according to California officials, that the state has more parking facilities and total parking spaces under its control than has any other single authority in the country.

Stewart has been traffic engineer in Santa Barbara since 1959. Before that he was in Fresno and Berkeley. His first traffic engineering work was in Portland (Ore.), where he started in 1938. During World War II he served in the Navy as a commissioned officer, with duty at Pearl Harbor, on Okinawa, and in Alaska.

A graduate of Lewis and Clark College in Oregon, Stewart has been active on the Parking Committee of the American Municipal Association as well as in state traffic matters in California.

Brandt Appointed Racine Traffic Engineer

Warren H. Brandt (Associate Member, ITE) was named City Traffic Engineer of Racine, Wisconsin, effective May 8th, 1961.

Warren H. Brandt

Brandt graduated from the University of Illinois in 1954 with a B.S. in Civil Engineering. Following graduation he was an Assistant to the District Traffic Engineer, Illinois Division of Highways at Elgin. He also worked in the East St. Louis and Effingham offices of the Division. His most recent assignment was Intersection Design Engineer at Effingham.

In 1956, he briefly held the position of Assistant Engineer with Harland Bartholomew and Associates, prominent St. Louis city planning firm.

He is a registered professional engineer in Illinois.

Lapin Joins Staff of Arthur D. Little, Inc.

Howard S. Lapin (Assoc. Mem., ITE) has joined the staff of Arthur D. Little, Inc. of Boston one of the largest and most diversified technical consulting companies in the country. Among its many activities is making studies for industrial-regional development. Lapin will be working on metropolitan and regional transportation studies in connection with this phase of the firm's work.

Lapin has been associated with Day and Zimmerman of Philadelphia on urban traffic and transportation finance studies. Earlier he was associated with the Institute for Urban Studies at the University of Pennsylvania. While on leave from the Institute, he served as senior staff member under the assistant director of the Urban Traffic and Transportation Board of the City of Philadelphia.

A graduate of Yale University in industrial engineering, he received the degree of Master of Engineering from the University of California in 1950, after two years of work at the Institute of Transportation and Traffic Engineering. He served as a staff member of the Institute from 1952 to 1954.

In addition to his membership in the Institute of Traffic Engineers, Lapin is an Associate Member of the American Institute of Planners.

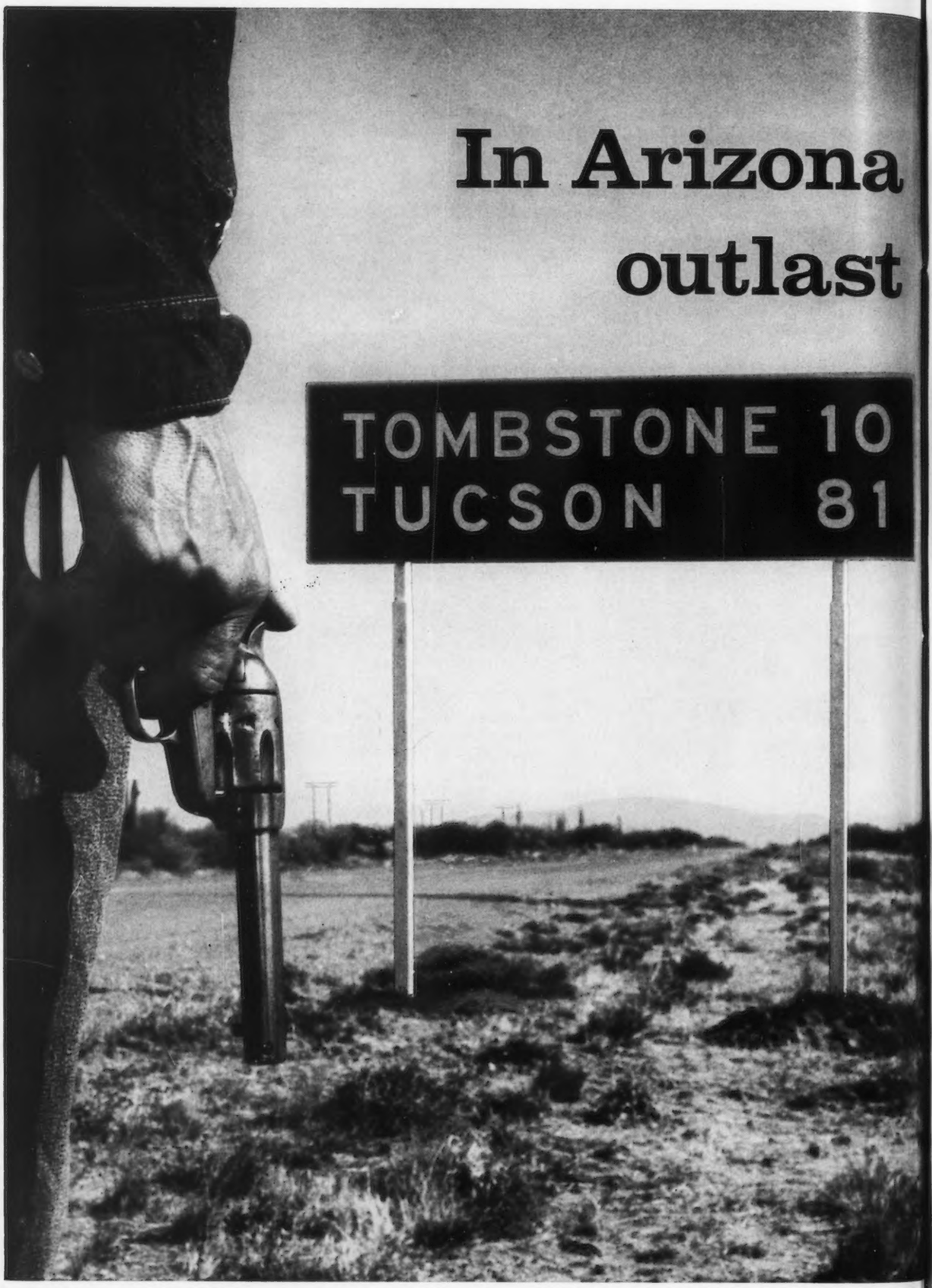
Oregon Names Dennis Peterson

Dennis Peterson

Dennis L. Peterson (Jun. Mem., ITE) has been named Oregon's first division traffic engineer, assigned to the Portland metropolitan area. This represents the first time the Oregon department has decentralized any of its traffic engineering activities. Peterson has been Engineer Economist in the highway planning survey section, and has been transferred to the traffic control section.

Mr. Peterson has been with the Oregon State Highway Department since 1951, when he started in the traffic investigation unit. He has moved upward through the department, being named to his last position in 1957.

Peterson is a civil engineering graduate of the North Dakota Agricultural College in Fargo, and is a registered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TOMBSTONE 10
TUCSON 81

overlaid plywood signs metal 3 to 1

SIGN REPLACEMENT WAS A REAL PROBLEM IN ARIZONA until the Highway Department switched to plywood. Trigger-happy motorists had been taking pot shots at metal signs. This led to rust, deterioration and often dangerously reduced legibility after only a few months of use. Then performance tests showed overlaid plywood's life expectancy was at least three times that of metal.

Now Arizona uses overlaid plywood for 85% of its signs. Vandals still shoot at them. But plywood stands up to both deliberate and accidental abuse without losing legibility. Bullets go right through without shattering the sign face. There's no corrosion problem; repairs are made quickly.

Overlaid plywood withstands Arizona's weather, too, with its extremes of heat, rain and snow. The plywood is completely waterproof, and the smooth, durable plastic-like surface makes an ideal base for reflectorized material.

Besides saving on maintenance and replacement, plywood signs are simple and inexpensive to fabricate. In Arizona's sign shop, a production-line process is used to make about 70 different basic signs, most with reflectorized legends.

FOR MORE INFORMATION (detailed specifications, application data, etc.) write:
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Plywood signs on Arizona's highways not only resist abuse from vandals and a rugged climate, but are attractive and easy to read. Fabrication in the state's sign shops is simplified because standard-sized panels of plywood are easy to store and easy to cut to required sizes and shapes. Above, reflectorized letters are applied to an overlaid plywood sign.

professional engineer in Oregon. He has been very active in work of the Western Section of the Institute.

In his new work he will be responsible for the coordination of traffic engineering activities in the metropolitan area and in surrounding counties. He will work with city and county officials on their problems and will coordinate construction and maintenance operations of the state division engineers with the local governmental agencies.

Loveless Moves To Phoenix

Theodore J. Loveless has resigned as an Extension Service representative for the Traffic Institute, Northwestern University, Evanston, Illinois and Glenn V. Carmichael, assistant director of training, has been named assistant director, Field Division, Extension Service.

Loveless has become City Court Administrator in Phoenix, Arizona. He will administrate all non-judicial court activities, including the Violations Bureau. A former member of the Indiana State Police, he joined the Traffic Institute in 1938 following his graduation from the Harvard Bureau of Traffic Research (now at Yale University). In January 1951 he resigned to become director of public safety for the University of Washington in Seattle. He returned to the Traffic Institute in 1952.

Wilson Elected President of NSPE

Murray A. Wilson, a consulting engineer of Salina, Kansas, has been elected president of the National Society of Professional Engineers.

Murray A. Wilson

Mr. Wilson, who established the consulting firm of Wilson & Company in 1941, holds engineering degrees from Kansas State University and an honorary doctor's degree from Kansas Wesleyan University. He has served as president of the Kansas Engineering Society and the Kansas Section of the American Society of Civil Engineers; has been a member of the ECPD Engineering College Accrediting Committee for Region V, the Kansas State College Research Foundation, and the Governor's Advisory Committee on Flood Control.

Mr. Wilson has served as chairman of a number of National Society committees, and is a past chairman of the NSPE Board of Ethical Review. He holds membership in the American Institute of Consulting Engineers, American Water Works Association, American Public Works Association, and the American Road Builders' Association.

Job Changes

Charles A. Clinard—formerly Director of Planning & Traffic with the City of Abilene, Texas; is now Field Engineer with the Bureau of Traffic of the Ohio Department of Highways in Columbus, Ohio.

James William Schmidt—formerly Assistant Manager of the Salt Lake Transportation Study in Salt Lake City, Utah; is now Transportation Planning Engineer with the Puget Sound Regional Transportation Study in Seattle, Washington.

John F. Coffin—is now Deputy Director with the Department of Traffic & Parking in New Haven, Connecticut; was enrolled at Yale University.

Frank L. Isbell—is now District Traffic Engineer with the Virginia Department of Highways in Petersburg, Virginia; was District Highway Traffic Engineer in Richmond, Virginia.

Coming Events

June 12-16—CALIFORNIA SHORT COURSE ON FUNDAMENTALS OF TRAFFIC ENGINEERING—
Registration fee $15. Contact: Bob Glenn, Institute of Transportation & Traffic Engineering, University of California, Berkeley 4, California.

July 10-12—WESTERN SECTION, ITE, ANNUAL MEETING—
Westward Ho Hotel, Phoenix, Arizona. Contact: Charles E. Haley, City Traffic Engineer, 112 S. Ninth St., Phoenix, Ariz.

August 21-26—WORLD TRAFFIC ENGINEERING CONFERENCE—
31st Annual Meeting, Institute of Traffic Engineers and International Sessions in Traffic Engineering, Sheraton-Park Hotel, Washington, D. C. Contact: ITE, 2029 K St. N.W., Washington 6, D. C.

September 24-29—ILLUMINATING ENGINEERING SOCIETY—
Technical Conference, Chase Park Plaza Hotel, St. Louis, Mo. Contact: IES, 1860 Broadway, New York, N. Y.

October 9-13—AMERICAN ASSOCIATION OF STATE HIGHWAY OFFICIALS—
47th Annual Meeting, Denver Hilton Hotel, Denver, Colorado. Contact: AASHO, 917 National Press Bldg., Washington 4, D. C.

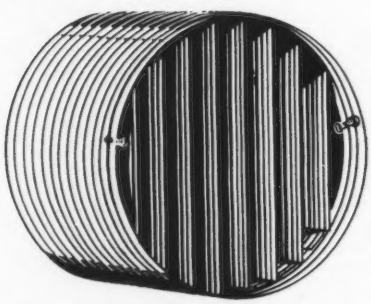
October 15-18—AMERICAN TRANSIT ASSOCIATION—
Annual Meeting, Baker and Adolphus Hotels, Dallas, Texas. Contact: ATA, 355 Lexington Avenue, New York 17, N. Y.

October 16-19—NATIONAL SAFETY CONGRESS AND EXHIBITION—
Congress, Conrad Hilton, and other hotels, Chicago, Ill. Contact: NSC, 425 N. Michigan Ave., Chicago 11, Ill.

October 16-20—AMERICAN SOCIETY OF CIVIL ENGINEERS—
Annual Convention, Hotel Statler, New York City. Contact: ASCE, 33 West 39th Street, New York 18, N. Y.

November 27-30—SOUTHEASTERN ASSOCIATION OF STATE HIGHWAY OFFICIALS—
Annual Convention, Hotel Marion, Little Rock, Ark. Contact: Raif M. Smith, c/o Arkansas State Highway Dept., Little Rock, Ark.

STOP *the practice of "jumping the light" at intersections by motorists and pedestrians . . .*



STRAITRAY

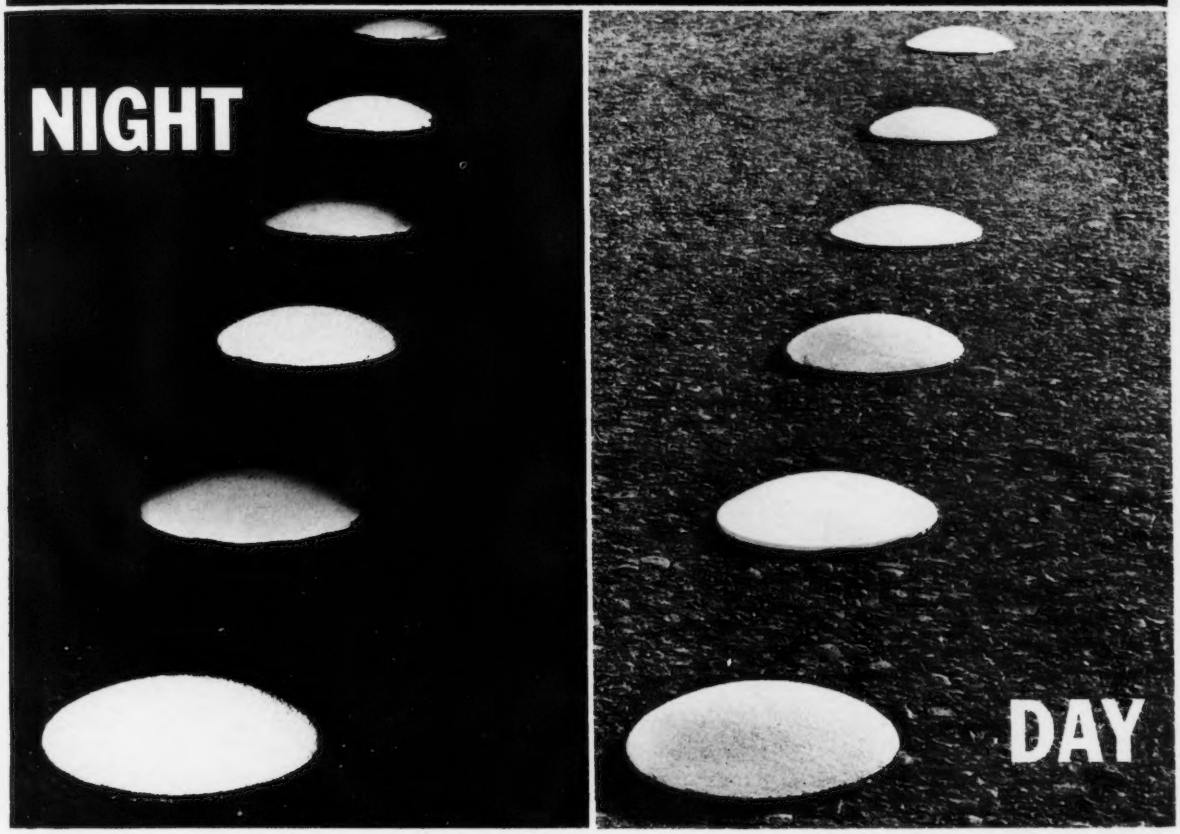
Scientifically Controls Traffic Signal Visibility

With STRAITRAY there is no advance "tip off" as to when light is about to change. Now you can do a better, more effective job on your Signal System at small additional cost. Light is seen only by motorist or pedestrian required to obey the signal.

Write for FREE technical brochure and price schedule:

PAM COMPANY
1951-B N.W. Wilson Street
Portland 9, Oregon

ROAD MARKING WITH 24 HOUR VISIBILITY



American-Marietta's

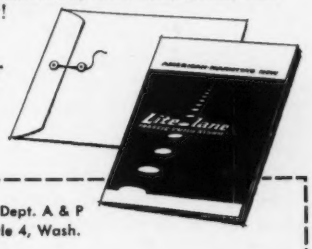
New night/day Lite-lane System outperforms any lane marking device on your highways!

An all-new companion to our durable glass beaded lane marker is now available. Gleaming white and satin smooth, the new marker is bright and stays bright in daylight or concentrated artificial light. Placed alternately with the reflective glass beaded marker, the two offer remarkable "round the clock" safety on any paved surface.

Both Lite-lane markers are extremely durable—up to 40 times the life expectancy of painted lines. More important, they stay brilliantly visible under conditions that kill the effectiveness of other types of highway marking. The reflective glass beaded model is most effective at night, even remaining visible in rainfall or fog. The nonreflective model resists highway grime to stand out under bright daylight or artificial light.

Besides markers, the Lite-lane Traffic Guide System includes an epoxy-type adhesive which is permanent for the life of the markers (10 to 20 years) and application equipment for placing the markers by a simple, low-cost system. Lite-lane offers unparalleled performance for lane lines, median lines, crosswalks, turn indicators, etc. Ask for the full facts today!

Check the coupon for complete Lite-lane information



American-Marietta Company, Dept. A & P
3400 13th Avenue S. W., Seattle 4, Wash.

Name .....

Title .....

Firm ..... Dept. .....

Address .....

City ..... Zone .... State .....

☐ *Send Lite-lane facts.*

AMERICAN-MARIETTA COMPANY

A-M

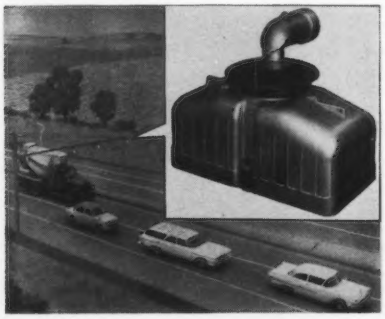
Adhesive, Resin and Chemical Division
3400 13th Avenue, S. W.
Seattle 4, Washington

New Equipment and Methods

Publication of product announcements in this section should not be construed as endorsement or approval by the Institute of Traffic Engineers

Infrared Vehicle Count Detector

The Eagle Signal Company, Moline, Illinois formally announced its New Eagle "I" ("I" for Infrared) Vehicle Counting Detector. After approximately two years of development and testing in conjunction with specialists at Infrared Industries, Waltham, Massachusetts, the units became available early in June.



"The Eagle 'I' will greatly complement Eagle's already complete line of vehicular traffic control devices. The newer computer systems and traffic actuated devices require more and more accuracy from the detection device. In the future, increased traffic volumes will be even more demanding of accurate count. For this reason we have taken great pains to develop our New Eagle 'I' Infrared Detector," stated E. R. "Ed" Malthouse, Eagle's Vice President in Charge of Engineering.

The Eagle "I" Detector has currently undergone rigid accuracy tests by the U. S. Department of Commerce, Bureau of Public Roads. Their tests were positive on a basis of 96% minimum accuracy. Federal participation funds are now available for the detectors in traffic counting service.

An Anti-Coincidence Count Accessory will also be available at Eagle Signal, exclusive distributor of the devices, for even greater count accuracy.

The Eagle "I" is an active type detector which produces its own modulated source of infrared energy and detects the reflection of that energy as vehicles pass through its 1½ x 6 ft. "curtain" of radiation across the vehicle lane. The "curtain" cross-section, though invisible, detects within an area equivalent to the well known pressure detector, thus eliminating possibility of cars passing around the side of the detected area. The possibility of extending the count in bumper to bumper traffic is reduced to an absolute minimum, and the Eagle "I" does not detect the roadway, therefore, the total possibilities of false calls are virtually eliminated with this one integral unit, measuring 18½ x 10 x 9 inches.

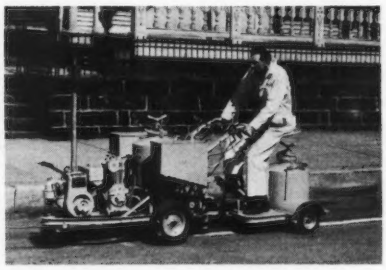
The unit is comparatively simple and maintenance free. The factory recommends only a once a year preventative maintenance check and general cleaning. The count detector and its components (except for the two projector source lights, available at any photographic supply store) is guaranteed for one year.

Eagle Signal plans to bring out its second model of the Eagle "I" shortly. Model No. 2 will be a side mount unit designed for multiple lane detection at the intersection.

Eagle Signal Company, 202 20th Street, Mobile, Illinois.

Tandem Tanker Introduced

An accessory for the popular Wald Model 16 Reflecto-Liner, a new Tandem Tanker, now makes it possible for owners of the unit to either convert easily to a two-color operation to meet new Federal two-color marking standards, or to doubling the paint capacity for a two-gun single color operation.



The unit has just been put on the market by Wald Industries, Inc., of Huntingdon, Pa.

The new tanker will also attach to the Wald Model 12 machine, greatly extending the striping time without a stop for refilling the paint tanks, according to the manufacturer.

The Tandem Tanker doubles the present 15-gallon paint capacity of the Models 12 and 16. It also serves as a compact trailer, with a comfortable seat for the operator.

Wald Industries, Inc., Huntingdon, Pennsylvania.

Motorola Awarded Contract

The New Jersey Turnpike Authority has awarded Motorola Communications and Electronics, Inc., a contract for radio control of 67 roadside warning signs. The $290,000 system will also provide linked and extended two-way radio communications coverage for fixed and mobile maintenance units along the 131-mile roadway.

The 67 neon signs to be radio-controlled show motorists six basic messages. They are DRIVE SLOW, ACCIDENT AHEAD, SNOW, ICE and FOG. Some locations also display reduced speed limit numbers. For radio control, the 67 signs are divided into 10 groups. Any combination of words at a single sign, at all or part of the signs in a group or at all signs on the turnpike will be turned on and off by radio from a central location.

A custom-designed control center in the Turnpike Administration Building in New Brunswick will serve as the system's "nerve center." It will include facilities to operate both the sign control system and the turnpike-wide maintenance network. One wall of the center will include a 19-foot long map of the turnpike for displaying the status of each of the 67 illuminated signs at any given moment.

The dispatcher in charge of the center will be able to utilize any one or a group of five base repeater receiver-transmitters, spaced about 25 miles apart at turnpike police stations, to transmit coded control tones to roadside signs or to send voice messages to maintenance vehicles and offices. The five 60-watt units will be installed, north to south, at Snake Hill, New Brunswick, Bordentown, Moorestown and Swedesboro.

Remote control of signs by radio is achieved within five seconds. Presently, the same job is handled by sending a trooper in a vehicle to the sign locations to control them manually. With the new system, for example, the dispatcher at New Brunswick presses four buttons to display "DRIVE SLOW ACCIDENT AHEAD" at a sign near Swedesboro, about 70 miles away. His selection at the sign control console, one button for the sign and three for the words, is converted to distinctive radio signals and transmitted to the Swedesboro base repeater. There the signals are rebroadcast.

THINK BIG ABOUT TRAFFITROL DETECTORS

The Traffitrol Detector near the top of that pole isn't aimed at Pike's Peak, but it *is* "looking" at a busy Colorado Springs intersection approach about 50 feet away. From this vantage point it has an unobstructed view of two lanes and controls the shopping center access signal in any weather.

It was easily installed on this pole using standard hardware and the convenient knuckle joint provided. Two men did it in one hour. Its marriage to the controller involved only a simple 6-pin connector. It will be easily moved and used elsewhere if conditions change here; otherwise, it will be a permanent installation requiring but one servicing every 2 years. Replaceable parts are available everywhere.

Traffitrol is the best choice for your *toughest* applications. Think about using it in those "impossible" situations requiring utmost reliability, trouble-free operation, and simplicity of installation. And use it in the easy ones, too!

Write today for the new Traffitrol bulletin to Heiland Division, Minneapolis-Honeywell, 5200 East Evans, Denver 22, Colorado.

HONEYWELL INTERNATIONAL
Sales and Service offices in all principal cities of the world. Manufacturing in United States, United Kingdom, Canada, Netherlands, Germany, France, Japan.

Honeywell
First in Control
SINCE 1885

A fully transistorized Motorola receiver-decoder unit at the sign picks up the signal and decodes it. The tones are converted to relay voltages to illuminate the four-word message on the sign. Other signs or the SNOW, ICE or FOG messages on the same sign are not affected because of the distinctive coded tones used. Series and groups of signs can be selected in the same fashion.

The maintenance segment of the system is scheduled for completion by early fall. The sign control system, which is capable of being expanded 200 per cent, will be in operation in early 1962.

Motorola Inc., Communications Division, 4501 West Augusta Boulevard, Chicago 51, Illinois.

Photoelectric Control Developed by GE

General Electric Company has announced the development of a new "Quick Response" photoelectric control, designed for outdoor lighting applications.

The new control is built around General Electric's exclusive cadmium-sulphide photoelectric cell. This cell is combined with a new, simplified circuit and a minimum of components to assure reliability and trouble-free operation. Each component used has been quality-proved in other field applications, ranging from missiles to computers.

The new G-E "Quick Response" control is designed for any lighting application where *extended* time delay is not desired. The new "QR" control functions automatically and efficiently to give precise control of any lighting circuit or of individual luminaires.

In addition to the G-E cadmium-sulphide photoelectric cell, components of the "QR" control include a hermatically sealed rectifier and a relay with special anti-weld alloy contacts normally-closed for "fail-safe" operation.

The components are mounted on a printed circuit board, minimizing wiring complexity, adding durability and eliminating wiring errors. An integral part of the printed circuit are multiple air gaps precision-set to provide protection from all surges in excess of 1400 volts.

The unit contains an externally adjustable shield for precise adjustment of light level setting. The cover and base are of non-corrosive non-conductive plastics. The "Quick Response" control will fit all NEMA-EEI receptacles on luminaires and associated devices.

The control will switch up to 1,000 watts incandescent load or 1,800 volt-amperes mercury vapor or fluorescent load. It has an operating range of 0.5 to 3.0 footcandles, and is available for either 120- or 240-volt operation.

General Electric Company, Schenectady, N. Y.

Life-Lane System Installed

Pacific Northwest motorists are pleased with recent installations of American-Marietta's new Lite-lane Traffic Guide System on two highways in Washington State.

The unique marking system is in use on U. S. Highway 99 between Seattle and Tacoma where it offers brilliant nighttime visibility even under common rain and fog conditions. The remarkably reflective glass-beaded plastic discs are applied to form a traffic line which can be seen even when surface water makes conventional painted stripes disappear.

A second installation put down by crews of Washington's King County on Ambaum Road near Seattle utilizes Lite-lane markers for both lane marking and median lines. Minimum lighting conditions in the area require a guide system that is unusually reflective when exposed to vehicle lights and that offers exceptional traffic channeling ability.

County road installation near Seattle dramatically demonstrates Lite-lane performance. The low profile markers offer safe traffic channeling on the hazardous curve. An audible bumping sound is produced when they are crossed to warn the careless or drowsy driver that he is straying from his lane.

Lite-lane marker installation between Seattle and Tacoma on US 99 demonstrates remarkable reflectivity on wet highway at night. Under similar conditions even heavily beaded paint stripes become virtually invisible.

An epoxy-type adhesive is said to bond the markers to the road surface with massive strength when applied with the company's automated application equipment. Spokesmen for the manufacturer emphasize that highway and laboratory tests establish the markers can be expected to maintain original brilliance on the road surface for as long as twenty years in heavy traffic areas.

An illustrated 16-page booklet detailing the Lite-lane Traffic Guide System is available on request.

American-Marietta Company, 3400 13th Ave. South, Seattle 4, Wash.

Flexible Rubber Posts

Flexible rubber posts have eliminated the often fatal "sudden stop" involved when a vehicle crashes into conventional highway guards.

Patterned after rubber dock fenders used to protect ships and piers, the virtually indestructible guards have dramatically demonstrated their effectiveness in safeguarding motorists and reducing vehicle damage in suburban Cuyahoga Falls.

In 1953, the city replaced steel posts guarding the start of a medial strip of a heavily traveled thoroughfare with a tandem set of flexible posts. During the previous decade, several motorists had been killed and extensive property damage sustained when errant autos crashed into the rigid barriers.

Although an average of five accidents a year occur at this "danger spot," only one collision report has been filed since the rubber "bumpers" were installed. The accident caused no injury and only minor vehicle damage, city officials report.

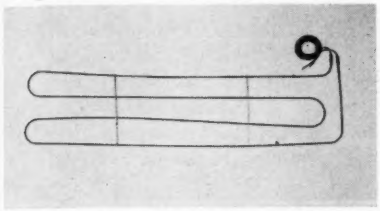
The guards were made by The Goodyear Tire & Rubber Company of a high tensile rubber compound. They require little maintenance and can be customized to fit all traffic safety requirements, the company said. Each post consists of a five-foot-high hollow rubber cylinder mounted on an 18-inch-long concrete-imbedded steel core that extends only a few inches above ground. This permits the cylinder to absorb the full impact when struck.

On impact, each post becomes increasingly resistant to flexing as the vehicle forces it from a vertical to a horizontal position, resulting in a braking action much like the stretching of a rubber band. This prevents the vehicle from possible further collisions with oncoming traffic in another lane, the company points out.

The Goodyear Tire and Rubber Co., Akron, Ohio.

"Snow-Bar" Electric Thawing Cable

The walks and driveways of schools, hospitals, hotels, and other commercial and institutional-type buildings can now be made safe from slippery snow and ice by means of a new electric metal-sheathed defrosting element, introduced by Edwin L. Wiegand Company, Pittsburgh, Pa.



The new heating cable, named Chromalox Thermwire "Snow-Bar," will withstand the 300 degrees F. Temperatures present when installed in hot-pack asphalt. It can be imbedded in asphalt, macadam or concrete surfaces or placed on present hard or gravel drives or walks and covered with a layer of the surfacing material.

Any of these surfaces can be kept free of snow build-up automatically by simply pressing a switch putting "Snow-Bar" in operation. Low in operating cost, this saves the expense and trouble of snow shoveling or mechanical clearance throughout the winter season. Average operating cost is 15 cents an hour for clearing wheel tracks of a 50-foot driveway.

The cable is available in 24-foot, 400 watt lengths and 40-foot, 675 watt lengths, both operating on 240 volts. These are formed into 36" diameter coils that can be shaped to almost any heat pattern desired, or pre-formed into 10' x 18" or 6' x 18" sections. Each has 10-foot leads for electrical connection. They are also usable in conjunction with other types of Chromalox flexible heating cable.

Edwin L. Wiegand Company, 7500 Thomas Boulevard, Pittsburgh 8, Pa.

Weather Instruments Catalog

A new catalog of weather instruments is available from Science Associates, Inc., of Princeton, N. J.

Featured are instruments which may be read by the use of large dials. Temperature, wind velocity, wind direction, humidity, barometric pressure, and rainfall may be so observed. Portable devices are also illustrated.

Similar devices are being used by traffic engineering departments to help in forecasting and planning for unusual weather conditions.

Science Associates, Inc., P. O. Box 216, Princeton, N. J.

New Highway Delineator Introduced

A new highway delineator that provides higher reflectivity, even in fog, mist and high moisture conditions than any other known type, has been developed by Prismo Safety Corporation, of Huntingdon, Pa.

The new delineator has been put on the market after extensive tests that have established its brilliance under favorable and adverse weather conditions, and its high visibility even when mounted at extreme mis-alignment.

The new product is available in a standard rectangular shape, approximately 3½ by 7¾ inches. It can be made up on order in virtually any shape to meet design requirements.

Prismo Safety Corporation, Huntingdon, Pennsylvania.

Visual Instruments Used

A new brochure published by Streeter-Amet Company features equipment showing weights on easy to read direct reading dials. Equipment is for use where printed weights are not required. The equipment has great flexibility and capacity for adaptation.

For further information, write for Bulletin 658-B24.

Streeter-Amet Company, Grayslake, Illinois.

New Publications

Ingenieria Del Transito

Luis E. Alvarez H., Penalolen 5929 (Nunos), Santiago, Chile. 1961. 211 pp. $12.00 (US).

Perhaps the first traffic engineering volume to be published in Spanish, this is the work of a Chilean traffic engineer who has studied both at home and in the United States. In addition to its technical excellence, the volume is interesting because the type was hand set, and the type impressions were made by the author.

This will be particularly valuable to Latin American engineers, who have long wished for a basic traffic engineering text in Spanish.

Future Highways and Urban Growth

Wilbur Smith and Associates, New Haven, Conn. February 1961. 376 pp.

This study of Interstate highways and their impact on urban transportation was conducted by Wilbur Smith and Associates, consulting engineers of New Haven, Connecticut, under commission from the Automobile Manufacturers Association.

Purposes of the study were threefold:

1. To determine the extent to which the Interstate highway system will meet the freeway requirements of urban areas of the United States up to the year 1980, and also the extent of requirements for fixed-rail and express-bus urban rapid transit systems in large metropolitan areas;

2. To project the future use of urban and rural Interstate highways, and to appraise their effects on traffic growth and the relief afforded to other roads and streets;

3. To assess the direct benefits to motorists in the form of fewer accidents and lower vehicle operating costs accruing from completion of the Interstate system by 1972, as well as the general benefits to the national economy, land values, and public services.

Conclusions of the study were:

There is urgent need for rapid completion of the 41,000-mile National System of Interstate and Defense Highways. Completion of the urban components of the system at the earliest possible date is essential to the economy and mobility of the nation and for the vitality of its cities.

Interstate highways now programmed will not be sufficient to meet the nation's future freeway needs. Accordingly, a continued and accelerated program of express highway construction, particularly in urban areas, should follow completion of the Interstate system in 1972.

Urban transportation needs will usually require that highways be augmented by public transit and that transit be fostered even though, at best, it will but hold its present levels.

Savings to the American public in lives, dollars, and time will far exceed the cost of the Interstate highway system. Hence, it is imperative that the necessary financing be provided for on-schedule completion of the Interstate system by 1972.

Although the full report is available in very limited quantities, a summary (10 pages) is available free from the Automobile Manufacturers Association, Detroit 2, Michigan.

The Cost of Motor Vehicle Accidents

Wallace I. Little and Harrison Grathwohl, University of Washington, College of Business Administration, Seattle, Washington. November 1960. 80 pp. Free loan.

This publication is a report of an

investigation authorized by the Interim Fact-Finding Committee on Highways, Streets and Bridges of the Washington State Legislature.

The study is a unique attempt to ascertain accident costs without the expense of the questionnaire-type studies made by several state highway departments in recent years in cooperation with the Bureau of Public Roads. In general, the method employed by the Washington investigators involved a determination of total premiums paid for automobile collision and liability insurance, to which were added estimates of the deductible losses sustained by insured drivers and the uninsured losses. To these direct losses were added indirect losses, such costs to the police in reinstating traffic, court costs, and costs to the licensing authorities in keeping records.

Finally, accident prevention costs were added to determine the total cost of accidents. Not taken into account were losses in productivity and a number of other rather indirect costs.

Automobile Facts and Figures—1961 Edition

Automobile Manufacturers Association, 320 New Center Building, Detroit 2, Michigan. 72 pp. Free.

This is the 1961 edition of a publication issued annually by the automobile manufacturers. In addition to sales data and vehicle registration figures, it contains valuable information on vehicle use and travel.

Traffic Characteristics at Regional Shopping Centers

Donald E. Cleveland and Edward A. Mueller, Bureau of Highway Traffic, Yale University, New Haven, Conn. 1961. 28 pp. (& 49 figures). Free.

This is a report of a study begun by Mr. Mueller in 1953, and continued by Mr. Cleveland together with a number of graduate students over a period of some six years. It covers such subjects as traffic movement variation, parking variation, comparison of sales and traffic activity, and annual peak hour volumes at typical regional shopping centers.

New Publication

• FREEWAY OPERATIONS

INSTITUTE OF TRAFFIC ENGINEERS
2029 K Street, N.W., Washington 6, D.C.
88 pp. $1.00 (reduced price for quantity purchases)

This book is a report on the 12 seminars conducted in 1958 and 1959 by the Institute of Traffic Engineers in all parts of the country on the subject of freeway operations.

The seminars recognized that the growing mileage of freeways, or roadways with fully-controlled access, presents traffic and highway engineers, planners, police and many other officials with new operational problems. The book follows the general pattern of the seminars, and discusses these problems under the following headings:

1. The Freeway Concept
2. Driver Characteristics and Training
3. Speed Characteristics
4. Accidents
5. Regulations and Regulatory Signs
6. Directional Signs
7. Geometric Design Elements
8. Freeway Connections
9. Traffc Operations During Construction
10. Motorist Services
11. Police and Emergency Services
12. Freeway Maintenance
13. The Future Operational Challenge

The publication contains many recommendations growing out of the discussions at the seminars. On controversial points, an attempt is made to present both sides of the argument. The book is well-illustrated and documented wherever possible with the most current data.

Technical Notes

HIGHWAY HARDWARE

By Wilbur S. Smith
Wilbur Smith and Associates
New Haven, Conn.

This report is excerpted from a presentation made by the author at the press conference announcing the publication of two "Technical Notebooks on Highway Hardware" by U. S. Steel, held in May in Chicago. The author's firm was responsible for the development of the designs and the detailed data presented in the notebooks, which not only review design considerations but show examples illustrating current typical practices.

Assume a decent surface and a well-engineered right-of-way, traffic signs, bridge rail, light standards, guard rail, and right-of-way fence . . . all are factors that make drivers decide whether a highway is "good" or "bad." More important, the safety and the skill which the driver uses on a highway depend directly on how these appurtenances function. Large sums of money are now being spent to provide improved traffic service through the construction of better roads, typified by the National System of Interstate and Defense Highways. It is not surprising, at the same time, to find that some highway agencies are for the first time setting up formal policies for the design and installation of "highway hardware," while others are continually reviewing practices that are suspected to be out of date because of the emergence of newer materials or in the light of deficiencies that have been experienced.

We would like to introduce to you the two volumes comprising U. S. Steel's "Technical Notebooks on Highway Hardware." The first volume, which is available now, deals with signs, and sign supports. The second covers bridge rail, light standards, guard rail, and right-of-way fence. This volume will be available in a short period of time. In order to make the Notebooks as useful to you as possible, design criteria are included as well as specifications and designs which illustrate proper use of various grades of steel.

Signs and Supports

As substantial segments of Interstate Highways are opened to traffic, it has become increasingly apparent that well designed and properly located directional signing is essential for the safe and efficient use of these highways. The sign messages must be easily read and understood by all motorists, and especially the transient motorist driving at high speed. Due to the number, size and expense of these installations, their structural adequacy, initial and maintenance costs warrant considerable attention.

Design standards for letter size, message content and sign locations have been established for the interstate system, fully recognizing the special problems encountered in regulating and guiding high speed traffic. The standards contained in the "Manual for Signing and Pavement Marking of the National System of Interstate and Defense Highways," developed by the American Association of State Highway Officials in 1958, have strongly influenced the signing of expressways and other major highways that are not a part of the interstate system. As a result, signs have become increasingly larger, and the use of overhead installations has become more widespread. Structures to support the signs have therefore become an important factor in this development.

The Technical Notebook on Sign Structures presents in an easily understood manner information that will facilitate the design and detailing of steel sign supports and sign faces. A loose leaf format is used so that the notebook may be supplemented from time to time with additional examples of unique applications and revisions that might be desirable because of changes in the applicable specifications and the availability of new materials.

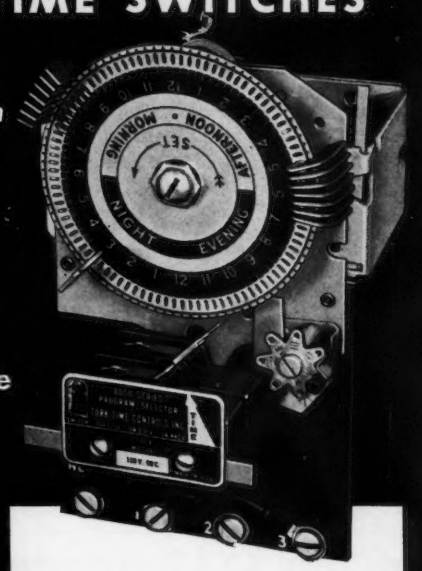
Arrangement of Notebook

The technical notebook is divided into five sections and an appendix. The first is general and informational in nature. The second we expect will contain the "Specifications for Highway Signs," prepared by the Special Subcommittee on Structural Supports for Highway Signs of the Joint A.A.-S.H.O.-A.R.B.A. Committee when adopted. Section 3 discusses and illustrates the steps necessary to design several sign support structures, including overhead and roadside applications; in Section 4, the design of sign faces for both small, simple sheet signs,

ONE TIME SWITCH REPLACES SEPARATE TIME SWITCHES

For Daily System Dial Selection

If you are still using conventional time switches in your traffic controllers — here's how you can improve performance and save money with TORK'S NEW One Dial-Three Circuit Program Time Switch for 3-dial controllers.



One dial controls 3 separate circuits . . . circuit #1, normally energized, controls dial #1 for normal daytime and nightime operation . . . circuit #2 switches to controller dial #2 for "morning inbound" . . . circuit #3 switches to controller dial #3 for "evening outbound".

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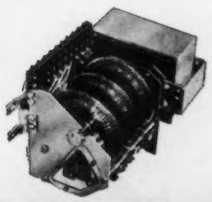

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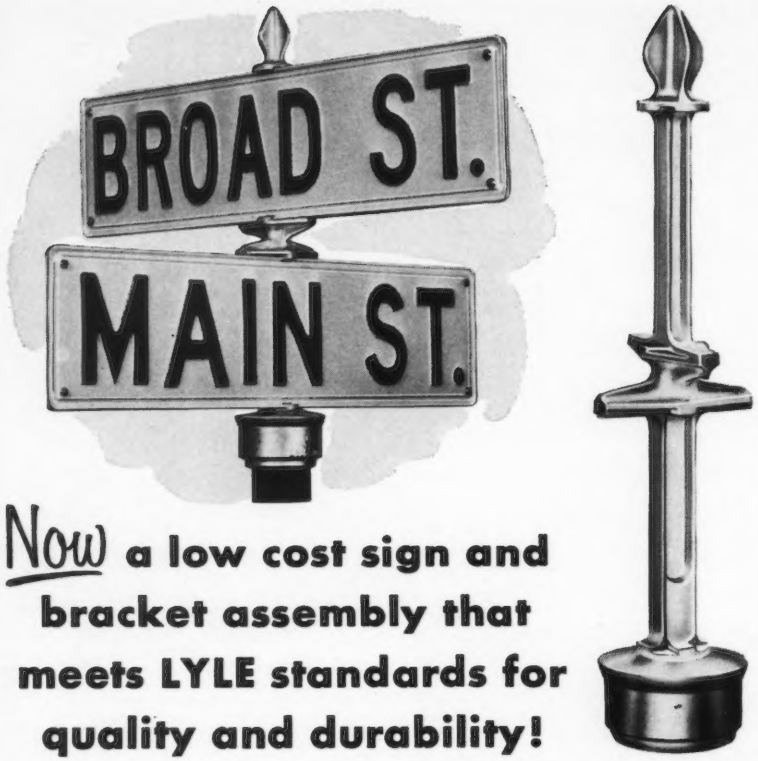

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as well as larger directional type sign panels, is illustrated. In Section 5, samples of current design practice for steel sign supports used by different highway organizations are illustrated. The Appendix contains examples of designs from the notebook and the equations used in establishing the designs.

The design procedures have been formulated so that the designer will have a choice of several alternate designs in different materials in order to compare for efficiency, economy, and aesthetics with minimum effort.

New Specifications For The Design and Construction Of Structural Supports For Highway Signs

While there are many examples of fairly large overhead and cantilevered sign supports existing on completed sections of urban and rural expressways, to this date design specifications have not been rigidly controlled and standardized. When the recommendations of the Joint A.A.S.H.O.-A.R.B.A. Subcommittee are completed and adopted, a nationwide standard for the design of sign structures will be available.

While design wind pressures throughout the United States vary from a low of 20 p.s.f. to a maximum of 80 p.s.f., approximately 95 per cent of the country is in an area where design wind pressures between 20 and 50 p.s.f. are specified—corresponding to wind speeds of 60 to 95 miles per hour. Alternate designs are presented in the Notebook for wind pressures of 30, 40, and 50 p.s.f., or wind speeds of 75, 85, and 95 miles per hour.

Perhaps the most rigid requirements of new specifications will be the deflection control. To provide high resistance to vibration at critical wind speeds, maximum vertical deflections equivalent to $d^2/400$ are included in the November draft, where d is depth of sign, in feet. For a sign depth of six feet, this would permit a maximum deflection of about one inch regardless of span length.

Ice loadings are assumed in all designs in the Notebook.

Sign Supports

The sign support structures detailed in the Notebook comply in all respects with the November 1960 draft of the A.A.S.H.O. specifications. Alternate designs are given for steels having basic stresses in tension of 20,000 and

27,000 p.s.i., respectively, representing A 36 and A 242 steels.

Overhead Sign Bridges

Overhead signs may be mounted on sign bridges spanning the roadway or may be cantilevered over the roadway from a single column support. A cantilevered mounting in which signs extend from both sides of the column is termed a "butterfly" installation. Designs for all three types of overhead structures are detailed in the Notebook. Shop practices are within the producing capability of most commercial steel fabricators.

Although sign bridges using a single horizontal structural member are satisfactory for supporting relatively small signs, the larger signs required for the interstate system, and the heavy wind pressures and rigid vertical deflection limits set by the new specifications, require the strength and stiffness of a truss type support. Accordingly, three sign bridge designs have been developed.

Bridge 1 is a simply supported box truss of uniform section well suited to standardization. It is easy to erect because sectional splices and column connections are simple. Depth of the truss is increased for longer spans to keep vertical deflections within permissible limits.

The rigid frame design of Bridge 2 provides good control of deflection in the intermediate span range. Since no transverse moment is transferred to foundations through the pinned column base connections, the foundation problem for the rigid frame is simplified.

Bridge 3 is a tapered box truss hung between two trussed cantilevered columns. Since the suspended center portion of the span is short, it has a high natural frequency and is less susceptible to wind vibration than simple or rigid frame spans of the same length. Therefore, the combination of cantilevered arms with the suspended center span permits control of vertical deflection in longer spans without increasing truss depth.

Bridge 1, the simple span box truss, is generally the heaviest of the three types, although a marked weight reduction is realized by using high strength steel in the longer spans. Bridges 2 and 3 are similar in weight for spans less than 130 feet; for longer spans, Bridge 3 shows a definite weight advantage. The use of high strength steel on Bridges 2 and 3 also results in a weight saving.

Cantilevered Sign Supports

Designs for cantilevered sign supports are presented for 30, 40 and 50 p.s.f. design wind pressures in both A 36 and A 242 steels. Pipe is used for the cantilevered support members because of its excellent strength in torsion. Where the structural members specified in A 36 steel are not readily available, A 53 pipe may be used. To resist the large lateral forces from the wind and the heavy vertical forces from the weight of large signs with ice loadings, a trussed arm is specified to control deflections that would otherwise be noticeable.

Trussed arm members are specified for each of the three wind loadings for sign depths of three feet four inches, and from 5 feet to 9 feet in 1 foot increments. Provision is also made for accommodating signs up to 12 feet in depth. The length of the cantilevered trussed arm is given in increments of 4 feet from 10 feet to 30 feet. These dimensions are ample for large overhead signs specified in the interstate sign manual. Member sizes are the same in A 36 and A 242 steel.

Butterfly Supports

Arms for butterfly supports are designed in the same manner as for the simple cantilever. The design of the pipe column of the butterfly support is somewhat more complicated due to the many variations of loadings that are possible. Therefore, formulae are presented for determining the column sizes required for known loading conditions in both A 36 and A 242 steels. A step by step design procedure is presented that can be easily followed.

Supports for Ground Mounted Signs

The simplest signs are regulatory and warning signs that are small enough to be made of unstiffened sheet steel. These may range from 12 by 18 inches in size for parking regulations on city streets to the 4 by 6 foot speed limit signs required for interstate highways. They are usually small enough in a horizontal dimension to permit mounting on a single support without excessive deflection. Sheet signs more

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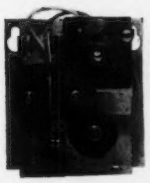

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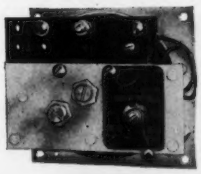

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than four feet wide should usually be designed using two posts. For sign widths greater than 6 feet, deflection and vibration of simple sheet signs becomes very difficult to control and it is necessary to introduce additional stiffness for the sign face.

Shown are post selection charts for sheet signs. Member sizes are given for 30, 40, and 50 p.s.f. wind loadings for both A 36 and A 242 steels. Both single post and double post installations are indicated where applicable. Using the required sign area and the height to the center of the sign, the size of post can be determined for either standard pipe or I-beam.

Surface Finish

Life of the protective coating used with steel depends directly on how well the steel itself resists corrosion. A 242 steel is excellent in this respect, having four to six times the resistance to atmospheric corrosion of regular carbon steels. Section 9 of the Specifications for Highway Sign Structures requires that steel structures be protected from weathering by painting or galvanizing. Provisions of the A.A.S.H.O. Bridge Specifications are cited to cover requirements for painting. If galvanizing is used, it is preferable that it can be done after sections of the sign support have been fabricated. However, it is also possible to use galvanized material and to touch-up with a zinc-rich paint any areas that are exposed by cutting or welding during fabrication.

Sign Faces

Sheet steel can generally be used for sign faces up to six feet wide. Wider signs require stiffening of face panels to control vibration and deflection.

Sheet Signs

The design of flat sheet signs for both single and double post installations for A 36 and A 242 steels and wind loadings of 30, 40, and 50 p.s.f. is detailed. Sheet thinner than 20 gage is not recommended; the range of 18 to 12 gage covers members. For the commonly used 4 by 6 foot speed limit sign used on interstate highways, an 11 foot post height would be required. Assuming A 36 steel and 40 p.s.f. wind loading, a standard pipe post 5 inches in diameter, weighing 14.62 lbs. per foot is required. For a double post installation, 3½ inch diameter standard pipe posts weighing 9.11 lbs. per foot would be needed. I-beams provide relatively low resistance to torsion, and are not recommended for single post applications. In the example previously given, another portion of the figure shows that two 6 inch I-beams, each weighing 12.5 lbs. per foot, would be required using 12 square feet per post at 11 foot height.

Standard pipe and wide flange posts required to support larger signs at design wind pressures of 30, 40 and 50 p.s.f. are indicated for both A 36 and A 242 steels in the Notebook. For a sign area of *200* square feet, assuming A 36 steel, and a design wind pressure of *40 lbs.* p.s.f. and mounting heights of 20 feet and 14 feet, the method of selecting the proper size standard pipe columns is shown. Ten inch diameter pipe weighing 34.24 lbs. per foot is required for the 14 foot mounting height and 12 inch pipe weighing 41.51 lbs. per foot is prescribed for the 20 foot mounting height. The formulae needed to compute the loadings at the base of the column, essential to determining the size of footing required, and details for base and anchor bolts are also given.

Similar design charts are presented for selecting wide flange columns for the larger signs.

Porcelain Enamel Signs

Porcelain enamel steel sign panels have been used successfully in highway and advertising sign work for many years. They are more expensive than paint or reflectorization; however, they provide much longer life. In California, all illuminated overhead signs are porcelain enameled steel.

The panel system that was shown is not feasible for enameled faces because of the welding that is involved in fastening sheets to the stiffening frame. The frame system used by the California Division of Highways consists of individual sign panels of 18 gage enameling steel 2 to 4 feet wide and up to 10 feet high. Panels are fastened to frames *after* enameling by means of brass machine screws with asbestos-backed washers to prevent damage to the porcelain enamel surface.

The ideal base metal for most porcelain enameled applications is a low-metalloid steel composed primarily of iron, with only a minimum of other elements such as carbon, manganese,

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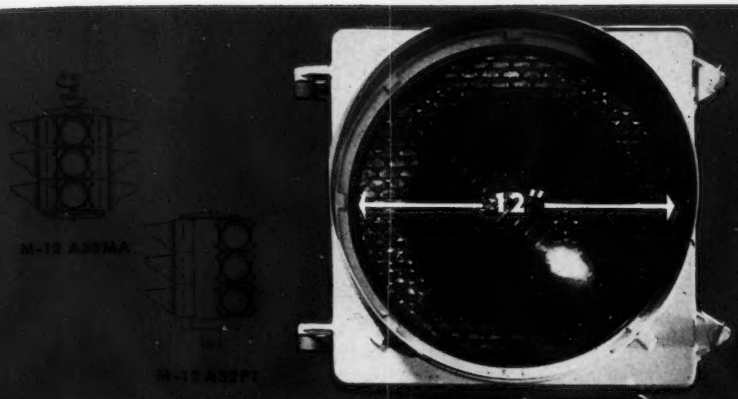

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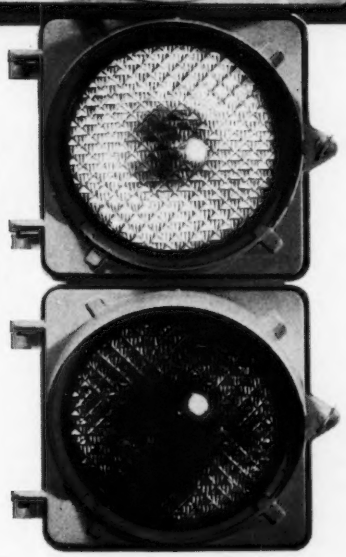

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phosphorus and sulphur. Steel sheets satisfying the requirements of A.S.T.M. A 242 do not become distorted when subjected to the high temperatures required to vitrify the porcelain enamel coatings.

Another base metal for porcelain enamel finishes, not used extensively as enameling steel at the present time, but appearing to hold considerable promise, is aluminum-coated steel. The chief advantage of this material lies in its resistance to corrosion in case the porcelain coating is damaged and the base exposed to air and moisture.

William H. Mann

William H. Mann (Member, ITE) died suddenly the morning of May 10 following a heart attack.

He was City Traffic Engineer for the Nashville Traffic Commission at the time of his death, a position he had held since 1946. He served as assistant traffic engineer in Nashville from 1941 to 1946. Earlier he had spent 10 years with the Illinois Division of Highways, and had also worked for the Solvay Process Co. and the Illinois Central Railroad.

Born in Chicago in 1900, he received his education at Montana State College and Colorado University, where he obtained a B.S. in civil engineering in 1923.

During World War II he spent three years as a Rail Transportation Officer and a Highway Transportation Officer, serving in the ETO.

Mr. Mann was active in work of the Technical Council of the Institute, and was the author of numerous articles on traffic engineering subjects. He pioneered in the matter of reserved lanes for transit buses, and Nashville received much national and international publicity as a result.

Nashville also has been recognized for its activities in connection with the Urban Transportation program recommended by the National Committee on Urban Transportation. Mr. Mann was prominent in this work, which involved the entire Nashville metropolitan area.

He was also active in the Southern Section, and served as president of the Section for 1957-58.

Bridge Rail, Light Standards, Guard Rail and Right-of-Way Fence

Volume 2 of the "Technical Notebook on Highway Hardware" deals with bridge rail, light standards, guard rail, and right-of-way fence. The general approach to these items is different from that used in Volume 1, in that no original designs are suggested. Instead, design considerations are reviewed and examples are included to illustrate current typical practices.

Bridge Railing

General dimensional and strength requirements for bridge railing are established by the A.A.S.H.O. Bridge Specifications. The Bureau of Public Roads in 1959 issued a Circular Memorandum pointing our deficiencies which had been experienced in railings meeting the A.A.S.H.O. requirements, and establishing supplemental design criteria for use on projects having Federal participation. It was stated that many panel type railings afforded poor resistance to impact loading, either because structural integration and continuity are lacking or because certain members, notably cast posts, fail upon impact. As applied to metal rails, the Bureau recommended that a barrier curb be used to provide primary deflection of vehicles, that a reinforced concrete parapet be used in conjunction with the rail where practicable, and that in the design of full height metal rails particular attention be given to post anchorage, rail continuity, and ductility of members.

Several designs of conventional panel type railings which meet these requirements are presented in the Notebook. Some are for parapet mounting, while others are for full height steel rails. Also shown are a design using beam type guard rail for the longitudinal members, and one which utilizes steel cable in conjunction with fascia rails formed from stainless or galvanized sheet steel. Extensive impact tests on various types of bridge rail are being planned by the U. S. Bureau of Public Roads. Results of these tests, as they may affect this notebook, will be incorporated as additions or revisions.

Light Standards

The Notebook section on light standards includes a discussion of the considerations which determine strength requirements — luminaire shape and weight, mounting height, and loads caused by wind, ice, and overhead conductors. Since most agencies purchase light standards from manufacturers who specialize in their production, the practices of some of the major commercial fabricators are analyzed. Also presented are the designs and specifications used by two state highway agencies and one electric utility company.

Guard Rail

Extensive full-scale impact testing of guard rail which is now in progress in New York State will probably change some present design concepts. Therefore, the scope of the Notebook section on guard rail is limited to the presentation of typical application practice drawn from several states. This section will be expanded to include basic design information as the tests are completed and the results analyzed.

Right-of-Way Fence

A suggested specification has been developed for woven wire and chain link fencing, intended for use in rural and urban areas, respectively. This specification is included in the Notebook with a drawing which shows construction details.

HIGHWAY PLANNING

(Continued from page 13)

which have always plagued our Highway Commission. People want to know what our long-range plans are—when do we propose to bypass an area; do we propose to four-lane this facility; or do we plan to relocate the facility entirely? The sound long-range plan will provide answers to these questions. We will be able to assist in further industrial and business development of North Carolina by being able to tell these people what they can anticipate in urban highway construction in upcoming years.

It is hoped that our urban highway planning legislation and policy will make more and more of our citizens cognizant of the necessity for sound planning programs, not only for the development of highways but for the overall development of their communities.

Such planning programs will not only help assure that maximum benefit will be derived from the expenditure of public funds but they will result in a better community.

URBAN TRAVEL TIME MEASUREMENT BY TAXICAB SPEED STUDIES

A condensation of a report prepared by the Regional Transportation Committee of Dayton, Ohio, Felix J. Rimberg, Secretary.

The uses of travel time are well known to those concerned with transportation in urban areas. Unfortunately, the cost of obtaining large quantities of data on travel time by the usual method of speed and delay runs is prohibitive. This is particularly true when an effort is made to collect information for large urban area transportation studies where use of electronic computers to do traffic estimations and route assignment is possible.

These two new uses of accurate travel time information make it imperative to determine economical techniques for the measurement of travel times throughout a region in order to utilize the major advances in data processing technique. To be sure, the use of electronic computers would be a major asset even without reliable or economical travel time information. However, insofar as travel times need to be "guesstimated," the end product, be it trip generation and distribution or route assignment estimates, will be affected in their degree of reliability.

As of the present writing, it is uncertain if this might become a substitute for detailed speed and delay runs for travel time measurements along *specific routes.* On the other hand, where travel time information between district centroids is required (such as in the Gravity Model trip generation and distribution techniques) a shortcut method of good statistical reliability and low cost has been discovered. It is hoped that further research and comment stimulated by this new technique will allow application of this method to the whole question of travel time measurement.

The method used to gather travel time information was based upon the same generalizations which underlie the Origin and Destination study: to allow statistical analysis of a great deal of travel time data, it is necessary to generalize points (zones or district centroids) for which travel time information is usable. In addition, a large and statistically reliable sample of data is required.

Since it is known that taxi-cab traffic characteristics resemble the characteristics of private passenger travel within an urban area quite closely and since taxi-cab trips may range from 2% to 5% of the total trips made in an urban area, this universe of travel may be used as a parameter of travel time for the entire region. In most cities taxi-cabs are required (by law) to maintain accurate records of the origin and destination of all their paid trips. In addition, some cities require the time of "pick up" to be recorded as well. Since longer trips may be accomplished faster by routes other than the most direct, distance traveled between points also becomes an important quantity for travel time measurement. This information may be computed from the fare reading of many taxi-cabs, inasmuch as fare can frequently be directly related to distance traveled.

It is clear at the outset that there are two basic short-comings to the utilization of taxi trips to approximate the universe of all vehicular trips:

1. Taxi-cab trips are highly CBD oriented. As many as 60% or 80% of all taxi-cab trips will have origins or destinations in the central district.

2. Taxi drivers most probably drive at somewhat faster speeds than the average driver, inasmuch as time savings are one of the most important commodities this form of transportation has to offer. (Since relative travel time is really the desired output, this fact should not be of major consequence).

As will be seen in the following, these two short-comings, while inherent in utilization of this technique, may be limited in their adverse effect upon the study.

Method Used

As part of the Dayton Area Transportation Study, the cooperation of the major taxi-cab companies was requested and gained. It was ascertained that the standard company form for recording origin and destination of trips would be available for data processing by the transportation study following the compilation of certain data by the companies. Since only the time of trip start was required by law, a new form had to be prepared for use by taxi drivers to allow recording of the time of both trip start and trip completion. This use of an *additional* form, including the requirement for driver orientation to this form (and duplication of one entry) was discovered to be no major obstacle to full driver cooperation. As a matter of fact, the use of a separate form which allowed space for entry of "Time Meter Starts" and "Time Meter Stops" was regarded as an asset, since it called attention to the importance of, and special need for, *accurate* measurement of time. In better than 7 out of 10 cases, the reports of the drivers —without any special instruction— showed times other than those ending in the digit 5 or zero, indicating that sufficient alertness to the requirement of accuracy was being given.

Following the completion of each day's run, the taxi drivers turned in the standard company form and the additional survey form. After use by the company, both forms were turned over to survey personnel. Both forms were compared and reports eliminated of drivers who failed to understand instructions or those who consistently reported trip times ending in round figures (5 or 10 minute intervals). For the remaining, usable records, the trip origin and destination information was coded by O & D zone and this and fare information transferred directly to the space provided in the second form.

The company form was then returned and the work form was readied for transfer to IBM cards with the following information:

a) zone of origin
b) zone of destination
c) time of trip start
d) time of trip stop
e) dollar value of fare

From this information the following general totals could readily be obtained by an IBM 650 computer at a rate of three thousand trips per hour:

a) Average speed of all trips
b) Average speed for all peak hour trips
c) Average speed of all off-peak trips

For the entire matrix of zone to zone movements the following information was given:

a) zone to zone movement;
b) number of trips reported;
c) number of peak hour trips reported;
d) number of off-peak hour trips reported;

e) average peak hour speeds;
f) average off-peak hour speeds;
g) average distance traveled (peak hour);
h) average distance traveled (off peak).

Use of Average Speed

It would seem at first that the desired output from this type of analysis would be the actual travel time (in minutes) between zone centroids or arterial "nodes." It is considered that an output identifying average speed is probably more valuable. This would appear to be an excellent measure of the difficulty in crossing over a given section of the urban area under existing conditions. The output could readily be converted to minutes for a given route assignment program (after the general difference between taxi driver speeds and the speed of private passenger cars has been studied) by dividing the average speed reported by the average length of trips for each zone-to-zone interchange. Some greater difficulty may be experienced in those cities where taxi meters do not only reflect distance traveled but reflect a combination of distance and elapsed time. In these cases, speedometer readings might have to be requested from the taxi drivers or a formula determined relating time and distance. The miles per hour output is also considered valuable since it allows easy interpolation of data for those zones that are "empty." Moreover, for traffic engineering analysis, as to route adequacy and difficulty of movement within certain regions of the city, this output is usable directly without further mathematical operations.

TABLE 1

COSTS OF PILOT SURVEY
(2086 Trips)

Coding of Origin and Destination	
80 Man Hours at $2.00/hour	$160.00
Punching IBM Cards	
6 hours at $4.00/hour	24.00
Programming and Machine Operation	
5 hours at $8.00/hour	40.00
Machine Time	
40 minutes at $150.00/hour	$100.00
	$324.00

Pilot Study

To test the above theories a pilot study involving 2086 taxicab trips was undertaken. The detailed analysis of this pilot study is not included here, but some generalizations are set forth in the section on conclusions.

A review of the costs of the pilot study (as shown in table 1) which used relatively unsophisticated coding techniques indicates that the cost of the travel time survey for the entire Dayton Metropolitan Area will be less than $5,000.

Conclusions

It would appear that the accurate measurement of travel time between all district centroids within an urbanized area is possible by use of this technique, at a fraction of the cost of the conventional speed and delay run. The travel times determined find use in a number of important studies, including the newly developed route assignment programs and gravity model methods of traffic estimation, which are known to be extremely sensitive to changes in reported travel time. The study also yields overall regional average speeds, which may find an important use as a measure of the adequacy of a region's street network.

Additional research in the following specific areas is required in order to fully utilize this new technique:

1. Determination of the best zone or district system for use in this study. Since gravity model estimates utilize data obtained from census reports, it might be advisable to code all origins and destinations to census tracts.

2. Determination of the relationship between taxi travel speeds and speeds of other vehicles.

3. Determination of the best method of summarizing the information in a graphic or statistical manner to accommodate other uses.

HIGHWAY RESEARCH BOARD NOTES

Many important papers were presented at the January 1961 meeting of the Highway Research Board in Washington. Most of these will be published by the Board, either in the *Proceedings* or in various bulletins.

A number of the papers of primary interest to traffic engineers have been digested in non-technical fashion and are presented here. It it hoped that this type of presentation may serve a useful purpose by alerting traffic engineers to the existence of technical information of subjects of concern to them.

Effect on Speed of Speed Limit Signs on Suburban Arterial Streets—a paper by Harold L. Michael, Purdue University, and Curt M. Elmberg, Swedish consulting engineer.

If every accident in which speed was the only violation could have been prevented, the number of accidents would have been reduced less than 10%, and if all accidents could have been prevented in which speed was the primary cause . . . the reduction in number of accidents would not have been much greater.

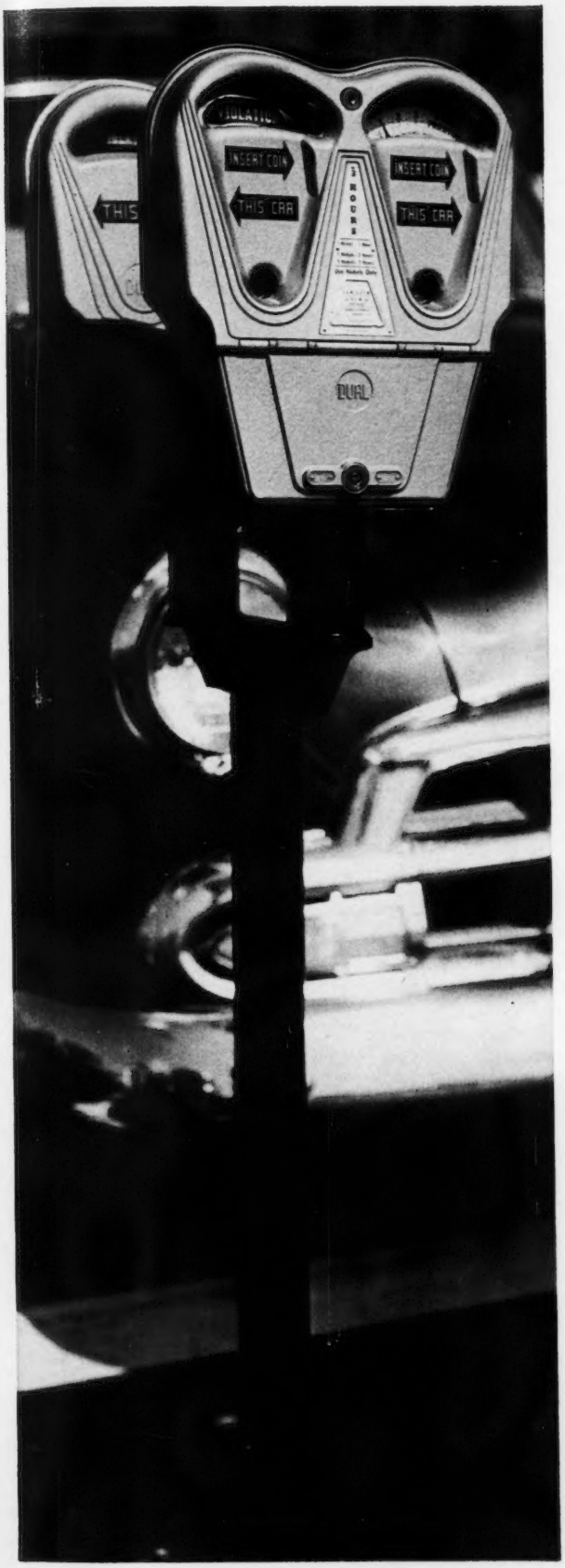
The studies also revealed, in relation to the engineering and policing difficulties of speed enforcement, that speed control is difficult because variations in driving behavior are present, and that speed control is controversial because of the divergence in opinion among engineers, enforcement officers, the motorists and the people living along the highway as to the proper speed and the appropriate method of controlling speeds.

The importance of speed control is that if properly done it may facilitate movement at uniform speed and thereby contribute to improved capacity and safety. It may also assist the motorist in selecting speeds that are safe and that permit him to obtain the maximum utility, economy and convenience from his vehicle and the road.

This carefully controlled study made along highways moving from rural into urban areas elicited some interesting factors in relation to driver behavior. It revealed that drivers in general do not drive according to posted speed limit signs. Most of them select a speed which they consider proper, reasonable and safe for conditions prevalent, regardless of regulations.

In relation to higher posted speed limits, it was revealed that the fear that the establishment of a speed limit which appears relatively high to some will create . . . faster speeds appears to have no foundation.

And lastly that most drivers will obey a posted speed limit if, and only



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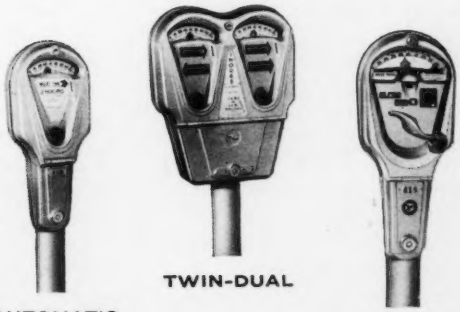

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The only complete line of automatic and manual parking meters

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if, the sign is properly posted and the numerical limit is reasonable.

Accident and Operating Experience at Interchanges—a paper by Ralph L. Fisher, New Jersey Highway Department.

Proper design of acceleration and deceleration lanes can practically eliminate accidents at expressway interchanges, according to the results of a four-year study of safety, operation and capacity of 50 interchanges on New Jersey's expressways.

Entrance ramp terminal accidents occur at interchanges which do not have adequate acceleration lanes. At such interchanges, vehicles have to slow down or stop before entering the main roadway. This places following drivers on the ramp in the difficult, if not impossible, position of trying to watch the car in the front as it merges with traffic on the main roadway and, at the same time, trying to look to the left at oncoming main roadway traffic.

Most drivers try to solve this problem by first watching the car in front and then looking at traffic on the main route. If, at that time, the car in front should suddenly stop because the driver at the last second found out that he had misjudged merging conditions, there is almost bound to be an accident.

Acceleration lanes observed in New Jersey of less than about 900 feet have poor accident records. When acceleration lanes are of the tapered type and over 900 feet long, the full length of the acceleration lane is used and drivers do not slow down before entering the main roadway. This eliminates rear-end collisions on the ramp. Main roadway traffic also yields the right-of-way to entering traffic.

Exit ramps also need long deceleration lanes to prevent traffic conflicts. It also was found that all of the left-hand entrances and exits under study had "poor accident records."

Factors influencing Growth in American Cities—a paper by Alan M. Voorhees, Automotive Safety Foundation.

Cheap land cost, rather than accessibility, today is a major factor in urban growth trends. Highways and the automobile have freed families and industrial plants so that they can make location choices on the basis of factors other than accessibility.

A ten-city analysis of factors influencing city growth revealed that, other things being equal, an area with cheap land may develop up to three or four times as fast as it theoretically should, on the basis of accessibility and availability of land.

As people rise in the income scale, however, they tend to place more emphasis on the type of area in which the home is located. Localities which are attractive in appearance, which have adequate public services, and which have any claim to distinction as "prestige areas" grow nearly twice as fast as those which do not.

There are many other elements involved in the rate of growth of a residential area. Lack of sewer or water service, for example, has held growth rates to about one-third of normal, everything else being equal. Otherwise attractive areas where land owners are deferring sale of property for tax advantages, or to make large capital gains, often have only half the growth that might be anticipated.

A Statement of the Urban Passenger Transportation Problem—a paper by Nathan Cherniack, Port of New York Authority.

Most cities will have to accept the inevitability of subsidizing their passenger transportation systems if they expect to adequately serve peak-hour travel movements.

Urban communities must also constantly keep these facts in mind. Serving the two sharp weekday morning and evening journey-to-work passenger volume peaks will invariably turn out to be deficit operations. This will be so even if journey-to-work passengers to and from Central Business Districts could be squeezed out of autos into buses on expressways, either through traffic regulations or through special local taxes. This will also be so even if all journey-to-work travelers used only common carrier mass transport and autos were actually prohibited in journey-to-work hours.

Mass transport can avoid deficits only if there is a substantial increase in non-rush hour travel and in week-end travel.

Mass transportation is essential in urban areas and few cities could exist today without some type of common carrier transit. However, to accommodate existing peripheral passenger travel demands between homes and sites of employment in low density areas, only an extensive network of highways and the private auto can meet this type of demand universally and adequately.

The low density type of suburban development that has been taking place in recent years is not capable of being served profitably by buses or other mass transit vehicles. If places of employment are concentrated in clusters, bus operations could be made practical thus reducing the demand for additional highway facilities.

To capitalize on the advantages of bus transportation for journey-to-work travel, employment clusters would have to be concentrated in industrial parks instead of in plants scattered over the landscape. Industrial parks would have to be large enough to concentrate some 5,000 to 10,000 employees, before bus transportation could become economically practicable to serve largely journey-to-work travel in low density areas.

Cities which have existing railroads and rail transit facilities that represent substantial invested capital should use them as effectively as possible, with subsidies if necessary. In this way the demand for highway facilities will be reduced.

Cities which have no existing rail facilities face a different type of problem. Before considering the construction of new rail facilities, such cities should first consider transportation by buses operating on freeways, with preferential or exclusive lanes for buses during morning and evening rush hours.

Highway departments should also design expressways so as to encourage fast bus transportation even in peak travel hours.

Summary of Test on Motor Vehicles Under Winter Conditions—a paper by A. H. Easton, University of Wisconsin.

The stop-and-go traction performance of various types of tires and tire chains on snow and ice-covered roads varies greatly.

Special winter tires are a definite aid for mild to medium winter conditions. Reinforced tire chains however, are the most reliable means to help the driving public avoid prolonged traffic delays and skid-wrecks during severe snow or ice conditions.

Exhaustive test programs at Clintonville, Wis., produced the following basic findings and recommendations for safer winter driving:

1. The most hazardous winter sur-

face condition is ice near or at the freezing temperature.

2. Braking distances on winter surfaces are in the order of 3 to 12 times as great as those on bare pavement.

3. Tires and traction devices listed in the approximate order of increasing effectiveness on winter surfaces are given below:

a. Smooth tires—Very poor in cornering. Should not be used.

b. Regular tires—Inadequate under many winter conditions.

c. Winterized tires (tread treatment and additives)—Provide better traction on ice; not much improvement in snow over regular tires.

d. Mud-snow, modern design—Provide better snow and ice traction than regular tires.

e. Embedded metal coils, serpentine ribs—Provide better snow and ice traction than regular tires. Effective on wet ice.

f. Sanders—Performance outstanding in traction on ice only.

g. Round wire tire chains—Good stop and go performance on ice and snow. Side-skid resistance low compared to reinforced tire chains.

h. Reinforced tire chains—Best overall performance on ice and snow.

4. A driver should select the tire that best suits his situation, and supplement it with reinforced tire chains when needed for severe conditions.

5. Pump brakes to reduce skidding, maintain steering control and shorten stopping distance. Use brakes judiciously to evaluate road surface if questionable.

6. If a vehicle begins to skid, the driver should reduce the power and turn the steering wheel in the direction of the skid until recovery begins.

7. The application of power and steering forces should be gradual and smooth on winter surfaces.

8. Use recommended tire pressures for best tire performance on ice.

9. The ideal brake for ice would be one which would produce maximum deceleration without wheel skid.

10. To maintain the best possible visibility, windshield wiper arms should exert a load on the blade, such that the pressure will be one ounce per inch of blade length.

11. The light and compact vehicles outperform the heavier vehicles on ice in the passing maneuver test where a shorter wheelbase is a distinct advantage. However, on constant radius curve, the heavier vehicle will outperform the lighter vehicle. In braking, the lighter vehicle will outperform the heavier vehicle.

Technical Council News

New Projects Approved

At its meeting on April 28-29, the Technical Council approved four new projects for committee action. Several others were also discussed, but formal action will await a review of the objectives and scopes of the proposed projects.

In Department 2, headed by Carlton C. Robinson, the following two projects were approved:

2A(61)—Rule Making Authority

Objective: To evaluate the existing status of the rule-making authority of traffic engineers and recommend the desirable status.

Scope: To evaluate the city traffic engineer's existing authority to establish traffic regulations (speed, turning, intersection control, parking, etc.) and to recommend the desirable level of authority.

2B(61)—Performance Evaluation

Objective: To itemize the principal yardsticks by which the effectiveness and performance of traffic engineering might be evaluated.

Scope: To study examples of urban traffic engineering from which a list of those criteria which indicate effectiveness and performance will be derived.

Under the direction of Sam Cass, several new projects were developed in Department 4. The two projects approved for the coming year are as follows:

4D(61)—Red and Yellow Arrow Signal Indications

Objective: To determine the possible application and interpretation of Red and Yellow arrow indications in traffic control signals and to develop a suitable research proposal, if it appears that such research will produce worthwhile results.

Scope: To assemble and consider present applications of red and yellow arrow indications and assess the validity of such usage.

4E(61)—Flashing Green, Amber and Red Signal Indications.

Objective: To determine the various functions for which flashing indications are used in traffic control and to recommend standard usage.

Scope: To assemble and consider the various applications for flashing indications in the normal sequence of a traffic control signal cycle, assess the validity of such applications and recommend a uniform practice.

Other projects which were proposed at the meeting included a study of the growth potential of traffic engineering as a profession, a compilation of design considerations for curb, lot and garage parking and the preparation of a standard for the flashing lights used on construction projects. All of these will be reviewed by the Department Heads concerned together with their Standing Committees to determine when and if the projects should be undertaken.

Those members of the Institute who are interested in work on one of the four approved committees should contact immediately either the Department Head concerned at his Yearbook address or S. G. Petersen, the Secretary of the Technical Council, at Headquarters. The Department Heads have selected chairmen for the committees and are now appointing members to do the work.

News of the other business conducted at the spring meeting of the Council will appear next month.

Section News

INDIANA, MICHIGAN and OHIO SECTIONS

The annual tri-state outing of the Indiana, Michigan and Ohio Sections will be held at Port Huron, Michigan, June 16-18. For further information, contact the Michigan Section secretary, Frank A. Ronan, 18424 Whitcomb, Detroit.

NORTHWESTERN UNIVERSITY STUDENT CHAPTER

Officers: Joseph R. Stowers, President; Richard D. Worrall, Vice President; Marvin C. Gersten, Treasurer; and Joseph A. Wattleworth, Secretary.

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After installation . . . cities report up to 80% of all parking fines collected are paid "on the spot" in DUNCAN FINE-O-METER boxes.

This effective, convenient system eliminates *embarrassing* trips to the police station thereby increasing voluntary payment without complaint. Also, *reduces* the number of tourist violators leaving city without paying fine.

Weather-proofed violation ticket-envelopes used with the DUNCAN FINE-O-METER are readily available at low quantity prices. New "heavy-duty" ticket envelopes, especially prepared to withstand long periods of exposure to extreme moisture now available for prompt shipment.

For good public relations . . . investigate DUNCAN'S convenient system of traffic fine collection.

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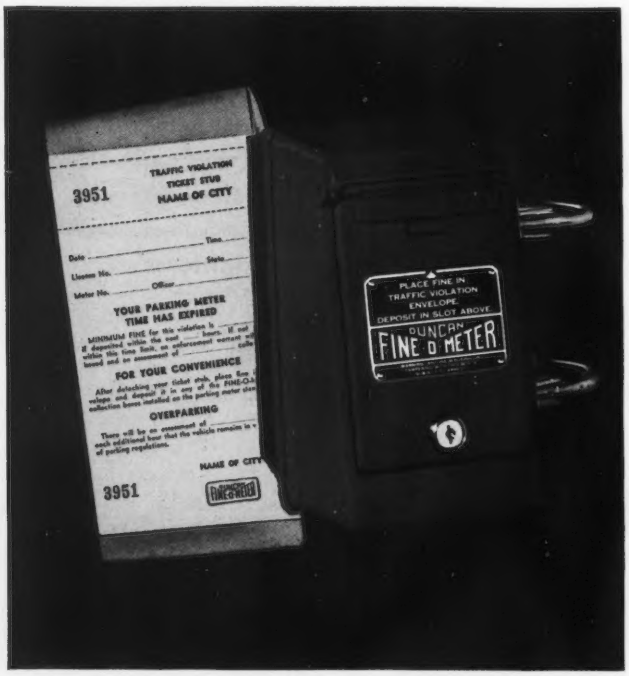

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Letters to the Editor

Sir:

There is a statement going the rounds which reads somewhat as follows: "Two-thirds of downtown Los Angeles is devoted to freeways, streets, and off-street parking." This statement is not correct.

According to the Los Angeles City Planning Department one-third of the *buildable area* is devoted to parking. Since the buildable area excludes streets, parking covers only 22% of the total area. This percentage should be even further reduced since some of this parking serves other purposes through vertical development. An obvious example is Pershing Square which is normally shown as a parking facility but is actually a city park covering a completely underground garage.

It would be of interest to know how these figures compare with other large cities in the country — as I recall, Washington, D. C. is rather well supplied with wide streets. A point which many seem to ignore is the fact that normally a large portion of a city is devoted to street use. A 400 ft. interval between 60 ft. wide streets will result in one-third of the area being devoted to streets. It should also be remembered that most downtown areas were quite well supplied with streets long before the automobile became the chief user of the streets, and that they continue to serve multiple uses including utilities, municipal services, and property access.

These figures are sometimes cited in support of a theory that downtown Los Angeles is destined to become a layer of concrete. Actually, I believe, we may see a reduction in these percentages in the future. Any planning for the city based on the ultimate freeway system will probably be able to devote proportionately less street area for movement of traffic due to the freeways' greater traffic efficiency per acre of land used. Also, as our downtown area continues to change, the trend toward more parking garages coupled with more reasonable sized cars can reduce the area devoted to parking.

Another point to be considered is that the recent change in building codes for the downtown area permits taller buildings and will result in increasing available office space while preserving open areas. The recent spurt in office building construction in downtown Los Angeles includes new buildings of 20 stories and more.

I would hope that there may be a little more objective thinking by others on this subject. Perhaps some other engineers will calculate similar percentages for their own cities so that we can further refute what I am confident is a spurious argument.

JOHN W. MCDONALD
Director, Engineering and Technical Services, Auto Club of Southern California

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Sir:

That the entire emphasis and orientation of traffic engineering is geared to the motorist and that the pedestrian has become a subsidiary factor can be seen from your various articles, such as those in your March issue.

If we are to have objective planning on behalf of pedestrian traffic in our rural areas and in cities, the pedestrian community will have to rely not on the traffic engineer who is beholden to motorists' interests but to the city planner who takes a more objective and overall view that will be conducive to pedestrian interests.

Sincerely yours,
Murray Spack, *Secretary*
Pedestrian League of America

(Ed.: See the "Toronto Pedestrian Crossover Program" in the February issue for an indication of the traffic engineer's concern for pedestrians.)

Sir:

My attention was attracted by the comments of Mr. J. A. Fraenkel, Israeli Ministry of Transport, published in the May issue of Traffic Engineering Magazine.

Mr. Fraenkel was worried about the Pedestrian Crossover sign used in Toronto and is afraid that such device will cause confusion and irritation.

We have erected similar signs in Montreal for over 2 years now without noticing any confusion nor irritation. On the contrary, the new sign is very good and has a real impact on drivers' behaviour, particularly at mid-block pedestrian crosswalks. Moreover, the shape and colour of the Crossover Sign are quite different from the standard Crossback Railroad sign.

The Toronto or the Montreal Crossover signs conform to the specifications set forth in Section A 3.09, Manual on Uniform Traffic Control Devices for Canada.

Mr. Fraenkel seemed to confuse the Pedestrian Crossing Advance sign (pedestrian silhouette on a diamond yellow background) with the Pedestrian Crossover sign, the first being a warning sign, the second being a regulatory sign.

As far as the European or the U. N. protocols are concerned, several of their signs are outstripped in quality and efficiency by the Canadian signs, the latter being more legible when compared to the others.

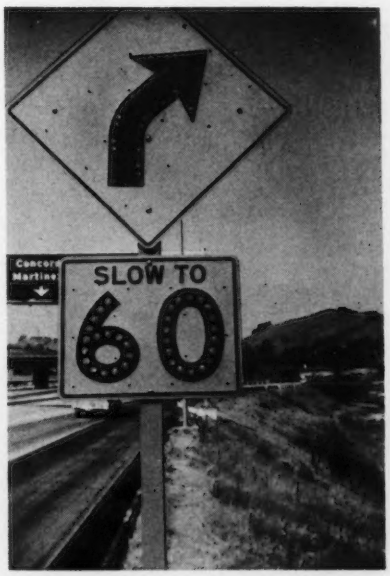
I agree to some extent that it would be desirable to have a world standard for traffic control devices, though this point is rather theoretical. In practice, a very little number of motorists coming from abroad are confused with the U. S. or Canadian traffic signs and most drivers are capable of learning their meaning quite rapidly.

Jacques Barrière, P. Eng.,
Assistant Director of Traffic
City of Montreal

Sir:

Enclosed is a photograph sent to me from California. I rather like it. At least the sign would indicate that the engineers recognize what drivers are doing.

Glenn V. Carmichael
Extension Services
Northwestern University
Traffic Institute



Positions Available

STATE OF ALASKA DIVISION OF HIGHWAYS

Position: Assistant Traffic Engineer to supervise traffic control and geometric design and urban projects units in the Traffic & Urban Section.

Requirements: Graduate civil engineer with a minimum of five years experience in highway and traffic engineering and eligible for registration as a professional engineer in Alaska.

Salary: $940-$1,115. Exceptionally well qualified applicants may start at $1,000.

Apply: Edwin L. Mills, State Traffic Engineer, 1224 East 7th Avenue, Anchorage, Alaska.

PUGET SOUND REGIONAL TRANSPORTATION STUDY

Position 1—Assistant Director — Research and Analysis, in charge of a major transportation study phase—responsible for data preparation and processing, analysis of study data, computer programming and processing, and urban transportation study research.

Position 2—Assistant Director—Traffic and Transportation, in charge of a major transportation study phase—responsible for internal and external origin and destination field survey; physical inventory; study system development, selection and analysis; traffic assignment by electronic computer, and systems evaluation.

Requirements—Appropriate knowledge and experience with responsible charge in urban research and analysis, traffic engineering and/or transportation planning. Degree with specialized postgraduate training or equivalent experience.

Salary—Open, commensurate with experience, three-year contract including complete moving and travel expenses to Seattle, Washington.

Apply—J. K. Mladinov, Director, Puget Sound Regional Transportation Study, Room 312, United Pacific Building, 1000 Second Avenue, Seattle 4, Washington.

CITY OF DOWNEY, CALIFORNIA

Position: Assistant Traffic Engineer—Under general supervision of the Traffic Engineer—assist in the collection and analysis of data pertaining to traffic volume, capacity, accidents, and parking studies, to plan and design intersection signalization, street lighting systems, and do related work as required.

Requirements: *Inexperienced level:* Graduation from an accredited college or university with major work in civil engineering. *Experienced level:* In addition to the requirements for the inexperienced level, one year of professional traffic engineering experience or graduate training required.

Salary: *Inexperienced level:* $571 to $694 per month. *Experienced level:* $629 to $766 per month.

Apply: City of Downey, Personnel Office, 8425 Second Street, Downey, California.

CITY OF HAMILTON, ONTARIO

Position: Assistant Traffic Engineer, to analyze field data, calculate signal timing, prepare designs for physical improvements, etc., and to make studies and report on traffic operations and traffic planning.

Requirements: Graduate engineer and a member (or eligible for membership) in the Association of Professional Engineers of Ontario. Some experience or knowledge in the field of traffic engineering is preferred. Education may be substituted for this experience.

Salary: Commensurate with training and experience.

Apply: Write, stating all particulars including age, training, and experience, to Director of Personnel, City Hall, Hamilton, Ontario, Canada.

CITY OF WICHITA, KANSAS

Position: Assistant Traffic Engineer.

Requirements: Graduate engineer with traffic engineering experience. Must be eligible for registration in Kansas.

Salary: Open.

Apply: Personnel Manager, City Building, 204 South Main, Wichita, Kansas.

CITY OF RICHMOND, VIRGINIA

Position: City Traffic Engineer.

Requirements: College degree; 7 years experience in traffic engineering, of which 5 shall have been in responsible charge; age 25 to 45.

Salary: $7800 to $9360.

Apply: John T. Hanna, Asst. Director of Public Safety, City Hall Annex, Richmond, Va.

CITY OF COLUMBUS, OHIO

Position: Assistant Chief Traffic Engineer, to assist in the administration of the City Traffic Engineering Division.

Requirements: Engineering graduate, registration plus four years experience.

Salary: $693 to $838 per month.

Apply: John L. Gallagher, Chief Traffic Engineer, City Hall Annex, 67 N. Front St., Columbus 15, Ohio.

DISTRICT SALES MANAGER MANUFACTURING COMPANY

Position: District Sales Manager. Growth opportunity with leading highway products manufacturer, involving direct selling and supervision of agents' sales.

Requirements: College degree, ITE membership, and/or related sales experience. Territory covers Southeastern states.

Salary: Commensurate with qualifications and experience.

Apply: Send all details of background and experience to: Box 561, c/o Traffic Engineering, 2029 K Street NW, Washington 6, D. C.

COUNTY OF FRESNO CALIFORNIA

Position: Traffic Engineer—Assistant.

Requirements: College degree in engineering plus one year of graduate work in traffic and transportation and one year of traffic experience. Additional experience may be substituted for the graduate work.

Salary: $595-$743. Those with qualifications above the minimum may be started above the beginning rate.

Apply: E. W. Firby, Director of Personnel, Room 101 Hall of Records Annex, Fresno 21, California.

UTAH STATE DEPARTMENT OF HIGHWAYS

Position: Traffic Engineer. Assistant to Manager. Salt Lake Metropolitan Transportation Study.

Requirements: Graduate in CE or TE, two years' experience in traffic engineering or combination of experience and education.

Salary: $615 to $725. May consider contract, to be negotiated.

Apply: Utah State Department of Highways, Personnel Division, State Office Building, Salt Lake City 14, Utah.

BALTIMORE COUNTY, MARYLAND

Position: Assistant Traffic Engineer (Planning & Studies). To be responsible for investigative staff, initiate and analyze traffic studies, coordinate planning activities related to traffic in expanding metropolitan suburban county.

Salary: $6639 to $7965 with yearly increases to maximum starting salary commensurate with experience.

Requirements: Engineering graduate, preferably with graduate training in traffic engineering or planning, plus minimum of two years traffic engineering experience.

Apply: Walter J. Addison, Chief, Division of Traffic Engineering, County Office Building, Towson 4, Maryland.

CITY OF BALTIMORE, MARYLAND

Position: Assistant Commissioner, Traffic Construction and Maintenance. In charge of all signal, sign and street marking, and all parking meter installation and maintenance. Responsible for programming work, developing specifications for equipment and material used in such work.

Requirements: Degree in engineering, 6 years experience in traffic engineering construction and maintenance, including 3 years of responsible supervisory experience, or equivalent combination of training and experience. Eligible for Maryland driver's license.

Salary: $8,640 per year, with automatic increases to a maximum of $11,100.

Apply: Civil Service Commission, Room 107 City Hall, Baltimore, Md.

NEW YORK CITY

Position: Highway Transportation Specialist to be responsible for specific studies and projects within a joint City-State Highway Transportation Study program.

Requirements: A baccalaureate degree plus completion of one academic year of advance study on the graduate level majoring in urban traffic operations or characteristics, highway transportation analysis or economics, or traffic research, plus one year of responsible experience in these specialized fields.

Salary: $7450-$9250 with yearly increases to the maximum. New York City residence NOT required.

Apply: New York City Department of Traffic, 100 Gold Street, New York 38, New York.

Position: Senior Transportation Specialist to act as a group chief within the joint City-State Highway Transportation Study program in charge of a major unit.

Requirements: A baccalaureate degree plus completion of one academic year of advance study on the graduate level majoring in urban traffic operations or characteristics, highway transportation analysis or economics, or traffic research, plus three years of progressively responsible experience in these specialized fields.

Salary: $9,000-$11,000 with yearly increases to the maximum. New York City residence NOT required.

Apply: New York City Department of Traffic, 100 Gold Street, New York 38, New York.

New Members and Transfers

Approved by tht Board of Directors, May 6, 1961

TRANSFERS FROM JUNIOR TO ASSOCIATE

HOMBURGER, Wolfgang S.
Assistant Research Engineer & Associate in Transportation Engineering, Institute of Transportation & Traffic Engineering, University of California, Richmond, California.

KOHN, Melvin J.
Assistant Operations Manager & Traffic Engineer, New Jersey Highway Authority, Red Bank, New Jersey.

MANNING, John Franklin
Director of Traffic & City Planning, City of Schenectady, New York.

MAY, John Franklin
Assistant to Traffic Engineer, Illinois Division of Highways, Bureau of Traffic, Springfield, Illinois.

NEILSON, Mogens Thor Madsen
Director, Traffic Engineering Services Department, City of Ottawa, Ontario, Canada.

ROTMAN, Morris
Traffic Analysis Engineer, Department of Public Works, City—Traffic Division, Toronto, Ontario, Canada.

SCHEMPERS, William, Jr.
Traffic Engineer, Automobile Club of Southern California, Los Angeles, California.

SHOCKEY, Jack W.
District Manager, Elizabeth Division of Elastic Stop Nut Corporation, Denver, Colorado.

WATSON, Frank Llewellyn
Senior Traffic Engineer, Traffic & Transportation Department, City of Houston, Texas.

WILLIAMS, Robert Carroll, Jr.
Director of Traffic Engineering, Traffic And Planning Associates, Hickory, North Carolina.

TRANSFERS FROM ASSOCIATE TO MEMBER

HENRY, Ellis C., Jr.
Traffic Commissioner, City—Traffic Division, St. Louis, Missouri.

HILLER, Sherwood H.
Traffic Engineer, City of Tampa, Florida.

JOHNS, Kenneth B.
Director, Division of Traffic, Kentucky Department of Highways, Frankfort, Kentucky.

MILLER, John Vinton, Jr.
Industry Representative, United States Steel Corp., Pittsburgh, Pennsylvania.

RICH, Marshall Miller
Associate Traffic Engineer, Wilbur Smith & Associates, Winston-Salem, North Carolina.

SAWHILL, Roy B.
Associate Professor of Civil Engineering, University of Washington, Seattle, Washington.

NEW JUNIOR MEMBERS

BESSELAAR, Oswald Hubert
Highway Designer, Idaho Department of Highways, Traffic Section, Boise, Idaho.

CAMPBELL, Lowell Raymond
Acting Assistant Traffic Engineer, City Engineering Department, Winnipeg, Manitoba, Canada.

CROSS, Seward Eugene
Civil Engineer I, City of Wichita, Kansas.

GUTHRIE, George Phineas
Research & Rural Intersection Studies Engineer, Bureau of Traffic, Ohio Department of Highways, Columbus, Ohio.

HOCKING, Richard Jon
Assistant City Engineer & Director of Public Works, City of Two Rivers, Wisconsin.

JIVATODE, George Ramkrishna
Traffic Engineer, D. C. Department of Highways & Traffic, Washington, D. C.

JOHNSON, Gerald Hobbs
Assistant Route Analysis Engineer, Ontario Department of Highways, Traffic Section, Toronto, Ontario, Canada.

LAPP, David Lawrence
Traffic Engineer, D. C. Department of Highways & Traffic, Washington, D. C.

LINSEMAN, Kenneth George
Traffic & Streets Engineer, Corporation of the City of Kingston, Kingston, Ontario, Canada.

MacDORMAN, Littleton Corbin
Location Engineer, Buchart Engineering, York, Pennsylvania.

NEVE, James Perry, Jr.
Engineer of Geometric Standards, Michigan State Highway Department, Lansing, 26 Michigan

REDFORD, Alex J.
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Jr. Traffic Engineer, Barton-Aschman Associates, Inc., Evanston Illinois.

TUC, Le-canh
Engineer-Planning & Research Division, Highway Department, Saigon, Viet-Nam.

WILLIS, Charles Louis
Traffic Engineer, Kentucky Department of Highways, Division of Traffic, Frankfort, Kentucky.

NEW ASSOCIATE MEMBERS

AUDIFFEREN, Solomon Bankole
Senior Executive Engineer, Highways, Federal Government of Nigeria, Federal Ministry of Works & Surveys, HQ., Lagos, Nigeria.

BEWICK, Robert Dixon, Jr.
Planning Engineer, Delaware State Nighway Department, Dover, Delaware.

CICETTI, Gerald Louis
Traffic & Planning Engineer, Howard, Needles, Tammen & Bergendoff, New York, New York.

DAVIS, Charles Robert
Chief Supervisor, Texas Highway Department, Planning Survey Division-Traffic Section, Austin, Texas.

FRITSCHE, Roland H.
Traffic Engineer, Milwaukee County Department of Public Works, Expressway Division, Milwaukee 3, Wisconsin.

FUJIMORI, Kenichi
Chief, Highway Planning Department, Japan Highway Public Corporation, Minato-ku, Tokyo, Japan.

GALANIS, James G., Jr.
Traffic Engineer, County Road Department, San Bernardino, California.

GREEN, Harry Horton
Supervisor, Traffic Engineering, Signal Division, City, 1801 A. Street, S. W., Cedar Rapids, Iowa.

GRUBB, Robert W.
Assistant City Traffic Engineer, City of Des Moines, Iowa.

LAKS, Edward Edmund
Roads Engineer, Corporation of the District of Burnaby, Burnaby, B. C., Canada.

McNEIL, Donald III
Assistant Traffic Engineer, Donald M. McNeil, Pittsburgh, Pennsylvania.

MENKE, Fred H.
Assistant Regional Planning & Research Engineer, U. S. Bureau of Public Roads, Hagerstown, Maryland.

RAINUSSO, Ivonne
Engineer in Charge of Traffic Section, Direccion de Vialidad Nacional, Montevideo, Uruguay.

SETTEDUCATO, Nicholas M.
Associate & Project Manager, Edwards & Kelcey, Newark, New Jersey.

SHELLMER, Richard A.
Traffic Engineer, Parsons, Brinckerhoff, Quade & Douglas, New York, New York.

WARNBERG, Donald Raymond
Associate Engineer, Supervisor of Traffic Regulation & Control Unit, Colorado Department of Highways, Denver, Colorado.

WILKES, John Ballingal
Planning Engineer, Ontario Department of Highways, Toronto, Ontario, Canada.

NEW AFFILIATE

SIMON, William J.
Safety Coordinator, National Highway Users Conference, Washington, D.C.

MEMBERSHIP APPLICATIONS

New Applications

The Institute of Traffic Engineers welcomes applications from qualified traffic engineers, but does not desire as members persons who are unqualified. Listed below are the names of those from whom applications for membership or transfer in grade have been received since the last published list. Institute members are urged to review this as soon as possible and immediately inform the Executive Secretary's office if names of people are found who are known to be unqualified for ITE membership or transfer.

ANDERSON, George Vincent
District Traffic Engineer, State Highway Commission of Wisconsin, Eau Claire, Wisconsin—for ASSOCIATE.

BARSZOWSKIM, Joseph
Traffic Engineer 1, Pennsylvania Department of Highways, Haverford, Pennsylvania—for JUNIOR.

BEMIS, Milton A.
Traffic Signal Engineer, Pennsylvania Department of Highways, Harrisburg, Pennsylvania—for ASSOCIATE.

CARLISLE, Tom Ivo
Assistant Civil Engineer, Town Council of Springs, South Africa—for JUNIOR.

CHAMPAGNE, Joseph Stenard
Chief Engineer, The National Fence Company, Inc., Meriden, Connecticut—for JUNIOR.

CHIANG, Ying-chung
Highway Engineer. Traffic Engineering Division, Cook County Highway Department, Chicago, Illinois—for JUNIOR.

COUTURE, Armand
Assistant Division Engineer, Transportation Division, Foundation of Canada Engineering Corporation Ltd. (FENCO) Montreal, P.Q., Canada—for JUNIOR.

CRAWFORD, Henry Lane
Supervisor—Administration & Routine Investigation Section, Operations Branch, Traffic Division, Engineering Department, City of Vancouver, B. C., Canada—for ASSOCIATE.

CURTIS, William Harold
Planner I—Transportation Planning Section, City of Vancouver, B. C., Canada—for ASSOCIATE

FOOTE, Robert Spaulding
Supervisor, Tunnel and Bridge Research, The Port of New York Authority, New York, New York—for ASSOCIATE.

FREED, Anthony Jay
Associate Traffic Engineer, Department of Streets and Traffic, City of Detroit, Michigan—for ASSOCIATE.

HANSEN, Walter George
Highway Research Engineer, Bureau of Public Roads, Washington, D. C.—for ASSOCIATE.

HOPKINS, Charles Richard
Regional Planning Engineer, Ontario Department of Highways, Southwest Region Office, London, Ontario, Canada—for ASSOCIATE.

KNAPP, Stuart E.
Traffic Engineer, City of Anchorage, Alaska—for ASSOCIATE.

LAW, William Alvin
Supervising Civil Engineer, County of Los Angeles, Road Department, Los Angeles, California—for ASSOCIATE.

ORRETT, Leyland Maurice
Associate Highway Engineer-Planning, California Division of Highways, Department of Public Works, San Francisco, California—for ASSOCIATE.

RACH, Leonard
Engineer I, Ontario Department of Transport, Toronto, Ontario, Canada—for JUNIOR.

SHARSKY, Edward J.
Assistant to the Commissioner, City of New York, Department of Traffic, New York, New York—for MEMBER.

SINGER, Paul
Traffic Engineer, City of Arvada, Colorado—for JUNIOR.

TIDWELL, Eugene
Assistant Planning Engineer, Highway Department, County of San Bernardino, California—for ASSOCIATE.

WILSON, Melvin Edmond
Associate Engineer-Civil, City of Seattle, Washington—for JUNIOR.

YARBROUGH, James William
Transportation Planning Engineer, Harland Bartholemew & Associates, Memphis, Tennessee—for ASSOCIATE.

Applications for Transfer

HARDY, James H.
Senior Traffic Engineer, Department of Traffic, City of Los Angeles, California—for MEMBER.

MATTHEWS, Roy W.
Assistant Traffic Engineer, California Division of Highways, Sacramento, California—for MEMBER.

McEACHERN, Cooper
Director, Department of Traffic & Transportation, City of Houston, Texas—for MEMBER.

MILLER, Edwin Herron
District Traffic Engineer, Michigan State Highway Department, Portage, Michigan—for ASSOCIATE.

STROMBOM, Donald Arthur
Traffic & Planning Engineer, King County, Seattle, Washington—for ASSOCIATE.

Yearbook Changes

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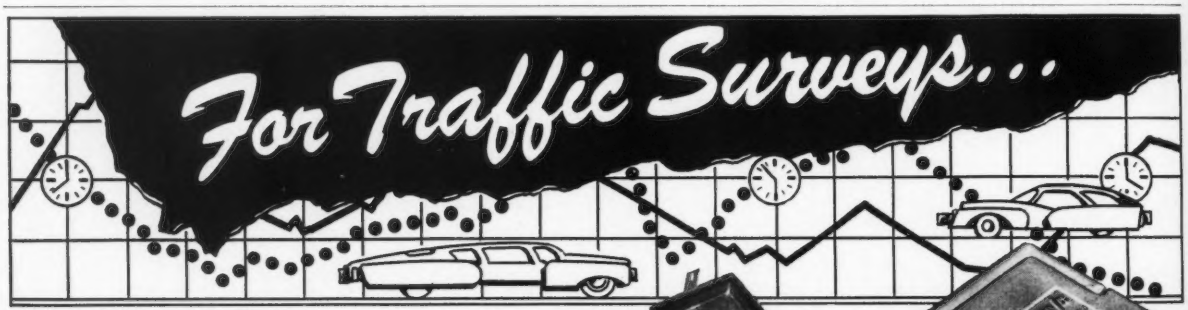
GRAVES, Richard M. (Associate)
Associate Highway Electrical Engineer, California Division of Highways, 50 Higuera Street, San Luis Obispo, California. LIberty 3-3597. SEND MAIL: 227 Highland, San Luis Obispo, California.

ISBELL, Frank L. (Junior)
District Traffic Engineer, Virginia Department of Highways, Box 391, Petersburg, Virginia. REgent 3-2121.

(Continued on page 54)



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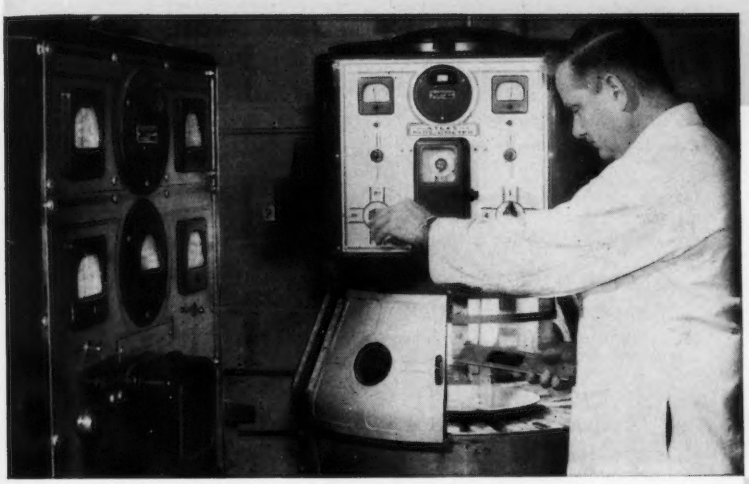

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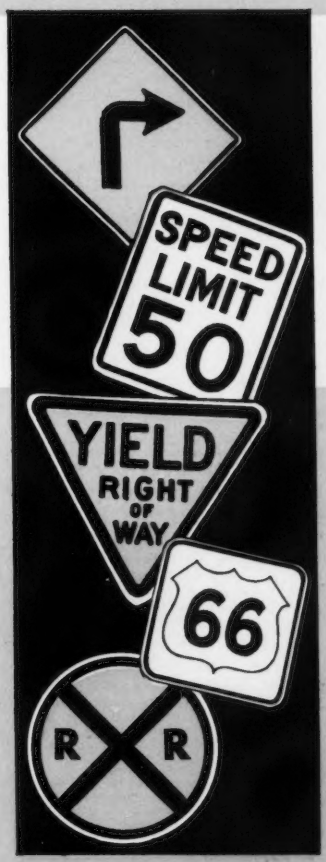

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YEARBOOK CHANGES

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VOORHEES, Alan M. (Member)
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